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Surveillance for Foodborne-Disease Outbreaks — United States, 1988–1992

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Contents

Introduction 2
Methods 3
Results 4
Discussion 9
References 12
Appendix A: CDC Form 52.13, Investigation of a Foodborne Outbreak 56
Appendix B: Guidelines for Confirmation of Foodborne-Disease Outbreaks 58

Reports Published in *CDC Surveillance Summaries* Since January 1, 1985

Subject	Responsible CIO/Agency*	Most Recent Report
Abortion	NCCDPHP	1996; Vol. 45, No. SS-3
AIDS/HIV		
Distribution by Racial/Ethnic Group	NCID	1988; Vol. 37, No. SS-3
Among Black & Hispanic Children & Women of Childbearing Age	NCEHIC	1990; Vol. 39, No. SS-3
Behavioral Risk Factors	NCCDPHP	1991; Vol. 40, No. SS-4
Birth Defects		
B.D. Monitoring Program (see also Malformations)	NCEH	1993; Vol. 42, No. SS-1
Contribution of B.D. to Infant Mortality Among Minority Groups	NCEHIC	1990; Vol. 39, No. SS-3
Breast & Cervical Cancer	NCCDPHP	1992; Vol. 41, No. SS-2
Campylobacter	NCID	1988; Vol. 37, No. SS-2
Chancroid	NCPS	1992; Vol. 41, No. SS-3
Chlamydia	NCPS	1993; Vol. 42, No. SS-3
Cholera	NCID	1992; Vol. 41, No. SS-1
Congenital Malformations, Minority Groups	NCEHIC	1988; Vol. 37, No. SS-3
Contraception Practices	NCCDPHP	1992; Vol. 41, No. SS-4
Cytomegalovirus Disease, Congenital	NCID	1992; Vol. 41, No. SS-2
Dengue	NCID	1994; Vol. 43, No. SS-2
Dental Caries & Periodontal Disease Among Mexican-American Children	NCPS	1988; Vol. 37, No. SS-3
Developmental Disabilities	NCEH	1996; Vol. 45, No. SS-2
Diabetes Mellitus	NCCDPHP	1993; Vol. 42, No. SS-2
Dracunculiasis	NCID	1992; Vol. 41, No. SS-1
Ectopic Pregnancy	NCCDPHP	1993; Vol. 42, No. SS-6
Elderly, Hospitalizations Among	NCCDPHP	1991; Vol. 40, No. SS-1
Endometrial & Ovarian Cancers	EPO, NCCDPHP	1986; Vol. 35, No. 2SS
Escherichia coli O157	NCID	1991; Vol. 40, No. SS-1
Evacuation Camps	EPO	1992; Vol. 41, No. SS-4
Family Planning Services at Title X Clinics	NCCDPHP	1995; Vol. 44, No. SS-2
Foodborne Disease	NCID	1996; Vol. 45, No. SS-5
Gonorrhea & Syphilis, Teenagers	NCPS	1993; Vol. 42, No. SS-3
Hazardous Substances Emergency Events	ATSDR	1994; Vol. 43, No. SS-2
Health Surveillance Systems	IHPO	1992; Vol. 41, No. SS-4
Hepatitis	NCID	1985; Vol. 34, No. 1SS
Homicide	NCEHIC	1992; Vol. 41, No. SS-3
Homicides, Black Males	NCEHIC	1988; Vol. 37, No. SS-1
Hysterectomy	NCCDPHP	1986; Vol. 35, No. 1SS
Infant Mortality (see also National Infant Mortality; Birth Defects; Postneonatal Mortality)	NCEHIC	1990; Vol. 39, No. SS-3
Influenza	NCID	1993; Vol. 42, No. SS-1
Injury		
Death Rates, Blacks & Whites	NCEHIC	1988; Vol. 37, No. SS-3
Drownings	NCEHIC	1988; Vol. 37, No. SS-1
Falls, Deaths	NCEHIC	1988; Vol. 37, No. SS-1
Firearm-Related Deaths, Unintentional	NCEHIC	1988; Vol. 37, No. SS-1

*Abbreviations

ATSDR	Agency for Toxic Substances and Disease Registry
CIO	Centers/Institute/Offices
EPO	Epidemiology Program Office
IHPO	International Health Program Office
NCCDPHP	National Center for Chronic Disease Prevention and Health Promotion
NCEH	National Center for Environmental Health
NCEHIC	National Center for Environmental Health and Injury Control
NCID	National Center for Infectious Diseases
NCIPC	National Center for Injury Prevention and Control
NCPS	National Center for Prevention Services
NIOSH	National Institute for Occupational Safety and Health
NIP	National Immunization Program

Reports Published in *CDC Surveillance Summaries* Since January 1, 1985 — Continued

Subject	Responsible CIO/Agency*	Most Recent Report
Head & Neck	NCIPC	1993; Vol. 42, No. SS-5
In Developing Countries	NCEHIC	1992; Vol. 41, No. SS-1
In the Home, Persons <15 Years of Age	NCEHIC	1988; Vol. 37, No. SS-1
Motor Vehicle-Related Deaths	NCEHIC	1988; Vol. 37, No. SS-1
Objectives of Injury Control, State & Local	NCEHIC	1988; Vol. 37, No. SS-1
Objectives of Injury Control, National	NCEHIC	1988; Vol. 37, No. SS-1
Residential Fires, Deaths	NCEHIC	1988; Vol. 37, No. SS-1
Tap Water Scalds	NCEHIC	1988; Vol. 37, No. SS-1
Lead Poisoning, Childhood	NCEHIC	1990; Vol. 39, No. SS-4
Low Birth Weight	NCCDPHP	1990; Vol. 39, No. SS-3
Malaria	NCID	1995; Vol. 44, No. SS-5
Maternal Mortality	NCCDPHP	1991; Vol. 40, No. SS-2
Measles	NCPS	1992; Vol. 41, No. SS-6
Meningococcal Disease	NCID	1993; Vol. 42, No. SS-2
Mining	NIOSH	1986; Vol. 35, No. 2SS
Mumps	NIP	1995; Vol. 44, No. SS-3
National Infant Mortality (see also Infant Mortality; Birth Defects)	NCCDPHP	1989; Vol. 38, No. SS-3
Neisseria gonorrhoeae, Antimicrobial Resistance in	NCPS	1993; Vol. 42, No. SS-3
Neural Tube Defects	NCEH	1995; Vol. 44, No. SS-4
Nosocomial Infection	NCID	1986; Vol. 35, No. 1SS
Occupational Injuries/Disease		
Asthma	NIOSH	1994; Vol. 43, No. SS-1
Hazards, Occupational	NIOSH	1985; Vol. 34, No. 2SS
In Meatpacking Industry	NIOSH	1985; Vol. 34, No. 1SS
Silicosis	NIOSH	1993; Vol. 42, No. SS-5
State Activities	NIOSH	1987; Vol. 36, No. SS-2
Parasites, Intestinal	NCID	1991; Vol. 40, No. SS-4
Pediatric Nutrition	NCCDPHP	1992; Vol. 41, No. SS-7
Pertussis	NCPS	1992; Vol. 41, No. SS-8
Plague	NCID	1985; Vol. 34, No. 2SS
Plague, American Indians	NCID	1988; Vol. 37, No. SS-3
Poliomyelitis	NCPS	1992; Vol. 41, No. SS-1
Postneonatal Mortality	NCCDPHP	1991; Vol. 40, No. SS-2
Pregnancy Nutrition	NCCDPHP	1992; Vol. 41, No. SS-7
Pregnancy, Teenage	NCCDPHP	1993; Vol. 42, No. SS-6
Rabies	NCID	1989; Vol. 38, No. SS-1
Racial/Ethnic Minority Groups	Various	1990; Vol. 39, No. SS-3
Respiratory Disease	NCEHIC	1992; Vol. 41, No. SS-4
Rotavirus	NCID	1992; Vol. 41, No. SS-3
Salmonella	NCID	1988; Vol. 37, No. SS-2
Sexually Transmitted Diseases in Italy	NCPS	1992; Vol. 41, No. SS-1
Smoking	NCCDPHP	1990; Vol. 39, No. SS-3
Smoking-Attributable Mortality	NCCDPHP	1994; Vol. 43, No. SS-1
Tobacco Control Laws, State	NCCDPHP	1995; Vol. 44, No. SS-6
Tobacco-Use Behaviors	NCCDPHP	1994; Vol. 43, No. SS-3
Spina Bifida	NCEH	1996; Vol. 45, No. SS-2
Streptococcal Disease (Group B)	NCID	1992; Vol. 41, No. SS-6
Sudden Unexplained Death Syndrome Among Southeast Asian Refugees	NCEHIC, NCPS	1987; Vol. 36, No. 1SS
Suicides, Persons 15–24 Years of Age	NCEHIC	1988; Vol. 37, No. SS-1
Syphilis, Congenital	NCPS	1993; Vol. 42, No. SS-6
Syphilis, Primary & Secondary	NCPS	1993; Vol. 42, No. SS-3
Tetanus	NCPS	1992; Vol. 41, No. SS-8
Trichinosis	NCID	1991; Vol. 40, No. SS-3
Tuberculosis	NCPS	1991; Vol. 40, No. SS-3
Waterborne Disease Outbreaks	NCID	1996; Vol. 45, No. SS-1
Years of Potential Life Lost	EPO	1992; Vol. 41, No. SS-6
Youth Risk Behaviors	NCCDPHP	1996; Vol. 45, No. SS-4

Surveillance for Foodborne-Disease Outbreaks—United States, 1988–1992

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Abstract

Problem/Condition: Since 1973, CDC has maintained a collaborative surveillance program for collection and periodic reporting of data concerning the occurrence and causes of foodborne-disease outbreaks (FBDOs).

Reporting Period Covered: This summary reviews data from January 1988 through December 1992.

Description of System: The surveillance system reviews data concerning FBDOs—defined as the occurrence of two or more cases of a similar illness resulting from the ingestion of a common food. Before 1992, only one case of intoxication by chemical, marine toxin, or *Clostridium botulinum* toxin as a result of the ingestion of food was required to constitute an FBDO. Since 1992, two or more cases have been required. State and local public health departments have primary responsibility for the identifying and investigating FBDOs. State and territorial health departments report these outbreaks to CDC on a standard form.

Results: During 1988–1992, a total of 2,423 outbreaks of foodborne disease were reported (451 in 1988, 505 in 1989, 532 in 1990, 528 in 1991, and 407 in 1992). These outbreaks caused a reported 77,373 persons to become ill. Among outbreaks for which the etiology was determined, bacterial pathogens caused the largest percentage of outbreaks (79%) and the largest percentage of cases (90%). *Salmonella* serotype Enteritidis accounted for the largest number of outbreaks, cases, and deaths; most of these outbreaks were attributed to eating undercooked, infected eggs. Chemical agents caused 14% of outbreaks and 2% of cases; parasites, 2% of outbreaks and 1% of cases; and viruses, 4% of outbreaks and 6% of cases.

Interpretation: The number of FBDOs reported per year did not change substantially during the first 4 years but declined in 1992 as a result of the revised definition of an outbreak. During this reporting period, *S.* Enteritidis continued to be a major cause of morbidity and mortality. In addition, multistate outbreaks caused by contaminated produce and outbreaks caused by *Escherichia coli* O157:H7 became more prominent.

Actions Taken: State and local public health departments investigate FBDOs. At the regional and national level, surveillance data provide an indication of the etiologic agents, vehicles of transmission, and contributing factors associated with FBDOs and help direct public health actions.

INTRODUCTION

The reporting of foodborne and waterborne diseases in the United States began >50 years ago when state and territorial health officers, concerned about the high morbidity and mortality caused by typhoid fever and infantile diarrhea, recommended that cases of "enteric fever" be investigated and reported. The purpose of investigating and reporting these cases was to obtain information regarding the role of food, milk, and water in outbreaks of intestinal illness as the basis for public health action. Beginning in 1923, the Public Health Service published summaries of outbreaks of gastrointestinal illness attributed to milk. In 1938, it added summaries of outbreaks caused by all foods. These early surveillance efforts led to the enactment of important public health measures (e.g., the Model Milk Ordinance) that had a profound influence in decreasing the incidence of enteric diseases, particularly those transmitted by milk and water.

From 1951 through 1960, the National Office of Vital Statistics reviewed reports of outbreaks of foodborne illness and published annual summaries in *Public Health Reports*. In 1961, CDC—then the Communicable Disease Center—assumed responsibility for publishing reports concerning foodborne illness. During 1961–1965, CDC discontinued publication of annual reviews but reported pertinent statistics and detailed individual investigations in *MMWR*.

In 1966, the present system of surveillance of foodborne and waterborne diseases began with the incorporation of all reports of enteric-disease outbreaks attributed to microbial or chemical contamination of food or water into an annual summary. Since 1966, the quality of investigative reports has improved, primarily as a result of more active participation by state and federal agencies in the investigation of outbreaks. Since 1978, because of increasing interest and activity in waterborne-disease surveillance, waterborne- and foodborne-disease outbreaks (FBDOs) have been reported in separate annual summaries. A summary of FBDOs was published for the years 1983–1987 (*1*). The present report summarizes data for FBDOs reported to CDC from 1988 through 1992.

Foodborne-disease surveillance has traditionally served three purposes:

- **Disease prevention and control.** A main prevention and control measure that results from surveillance of foodborne disease is early identification and removal of contaminated products from the commercial market. Other resulting prevention and control measures include both the correction of faulty food-preparation practices in food-service establishments and in the home and identification and appropriate treatment of human carriers of foodborne pathogens.

- **Knowledge of disease causation.** The responsible pathogen is not identified in more than half the FBDOs reported to CDC. In many of these outbreaks, pathogens might not have been identified either because laboratory investigations were initiated too late or were incomplete. In other outbreaks, the responsible pathogen may not have been identified, even after a thorough laboratory investigation, either because it may not have been recognized as a cause of foodborne disease or because it could not be identified by available laboratory techniques. If, in the future, more thorough clinical, epidemiologic, and laboratory investiga-

tions are conducted, perhaps many of these pathogens will be identified and suitable measures for prevention and control will be instituted.

- **Administrative guidance.** The information derived from investigations of FBDOs enables both assessment of trends in the prevalence of outbreaks caused by specific etiologic agents and in vehicles of disease transmission. Such information also helps identify common errors in food handling. The compilation and publication of this information enables state and local health departments and others involved in the implementation of food-protection programs to remain informed of the factors involved in FBDOs. Comprehensive surveillance should result in a greater awareness of the most important food-protection methods, the institution of better training programs, and more effective use of available resources.

METHODS

Sources of Data for Foodborne-Disease Outbreaks

Outbreaks are reported to CDC on a standard reporting form (CDC Form 52.13, Investigation of a Foodborne Outbreak)(Appendix A). Most reports are received from state and local health departments; they also may be received from federal agencies (e.g., the U.S. Food and Drug Administration, the U.S. Department of Agriculture, and the U.S. Armed Forces) and occasionally from private physicians. Data on these report forms are reviewed at CDC to determine whether a specific food vehicle and etiologic agent for an outbreak have been confirmed (Appendix B). In some instances, questions concerning an etiology may be referred back to the reporting agency; otherwise, data are accepted as reported on the forms.

Limitations of the Surveillance System

FBDOs on cruise ships are not included in this surveillance system. Disease outbreaks also are not included if the food is eaten outside the United States, even if the illness occurs within the United States. Finally, FBDOs are not included in this surveillance system if the route of transmission from the contaminated food to the infected persons is indirect.

Many foods contain several ingredients, but only one food-vehicle category is chosen for categorizing each outbreak. Therefore, the reported number of outbreaks attributed to a particular food item may not include all the reported outbreaks caused by that item. For example, homemade ice cream containing milk and eggs is listed under "ice cream" rather than "milk" or "eggs." The category "Mexican food" includes vehicles made from beef, cheese, lettuce, and other ingredients.

Definition of Terms

An FBDO is defined as the occurrence of two or more cases of a similar illness resulting from the ingestion of a common food. Before 1992, three exceptions existed to this definition; only one case of botulism, marine-toxin intoxication, or chemical intoxication was required to constitute an FBDO if the etiology for that type of FBDO

was confirmed. The definition was changed in 1992; currently, two or more cases are required to constitute an outbreak.

Outbreaks of known etiology are those for which laboratory evidence of a specific agent is obtained and specified criteria are met. Outbreaks of unknown etiology are those for which adequate laboratory evidence of the etiologic agent is not obtained. Outbreaks of unknown etiology are divided into four subgroups by incubation period of the illness: <1 hour (probable chemical poisoning), 1–7 hours (probable *Staphylococcus aureus* or *Bacillus cereus* food poisoning), 8–14 hours, and ≥15 hours (other agents).

RESULTS

The results of this surveillance system are presented for each of the 5 years (1988–1992) as follows: outbreaks by state (Figures 1–5); outbreaks, cases, and deaths by etiology (Tables 1–5); outbreaks by etiology and month of occurrence (Tables 6–10); outbreaks by etiology and place where food was eaten (Tables 11–15); outbreaks, cases, and deaths by vehicle of transmission (Tables 16–20); outbreaks by etiology and vehicle of transmission (Tables 21–25); and outbreaks by etiology and contributing factors (Tables 26–30).

For each of the years from 1988 through 1992, the most commonly reported food-preparation practice that contributed to foodborne disease concerned improper holding temperature; the second most commonly reported practice concerned poor personal hygiene of food handlers. Food obtained from an unsafe source was the least commonly reported factor for all 5 years. In most outbreaks caused by bacterial pathogens, the food was stored at improper holding temperatures. In outbreaks of trichinosis, the food was usually inadequately cooked. In outbreaks of ciguatoxin and mushroom poisoning, the food itself was unsafe, and illness was not related to improper handling or preparation.

1988

In 1988, 451 outbreaks involving 15,732 cases of foodborne diseases were reported to CDC. Reports were received from 44 states, the District of Columbia, and Puerto Rico (Figure 1). New York reported the largest number of outbreaks (106, including 17 from New York City). Washington reported the next largest number (45), followed by Illinois (37), Florida (24), Hawaii (22), Pennsylvania (21), and Wisconsin (20). The etiology was confirmed in 183 (41%) of the 451 outbreaks (Table 1).

Bacterial pathogens accounted for 139 outbreaks (7,156 cases). *Salmonella* caused most of the bacterial FBDOs (94 outbreaks, 2,987 cases) followed by *Clostridium botulinum* (20 outbreaks, 49 cases) and *S. aureus* (eight outbreaks, 245 cases). *Salmonella* serotype Enteritidis caused 44 (47%) of the 94 *Salmonella* outbreaks; eggs or foods containing eggs were implicated in 18 (64%) of the 28 *S.* Enteritidis outbreaks that had a known vehicle. Seven outbreaks (28 cases) of botulism occurred in Alaska and were associated with the preparation and storage of traditional foods of Alaskan Natives; one person died from botulism. A large outbreak of *Shigella sonnei* infections occurred among persons who ate a raw tofu salad at an outdoor music festival in Michigan; 3,175 persons became ill and 117 of these persons were hospitalized. A large number of volunteers handled the ingredients, and ill food handlers apparently

contaminated the salad during preparation (*2*). An outbreak (120 cases) of *Campylobacter jejuni* infections was caused by drinking raw milk at a vacation Bible school in Kansas. *Escherichia coli* O157:H7 caused two outbreaks; one outbreak (54 cases) was caused by precooked meat patties served at a school cafeteria, and one (55 cases) was linked to roast beef served at a university banquet.

Chemical agents were responsible for 29 outbreaks (139 cases); scombrotoxin caused 16 of these 29 outbreaks (65 cases), and ciguatoxin caused four of them (eight cases). Tuna was implicated in 11 of the 16 scombrotoxin outbreaks. All three parasitic-disease outbreaks (34 cases) were caused by *Trichinella spiralis*; two were associated with meat obtained by hunting. All 12 viral-disease outbreaks (795 cases) were caused by hepatitis A. One hepatitis A outbreak (202 cases) occurred among restaurant patrons in Kentucky and was traced to iceberg lettuce contaminated before distribution (*3*). Another multistate hepatitis A outbreak (61 cases) was caused by eating raw oysters that apparently had been harvested illegally from an oyster bed in Florida that was contaminated by human feces (*4*).

Nineteen deaths from foodborne illness were reported; of these deaths, 14 were caused by *Salmonella*, three by hepatitis A, one by *C. botulinum*, and one by scombrotoxin. Nine of the deaths caused by *Salmonella* were attributed to *S.* Enteritidis, and seven of these deaths occurred in residents of nursing homes. The incubation period was reported for 211 (79%) of the 268 outbreaks that had an unknown etiology; in three outbreaks (1%) the incubation period was <1 hour; in 59 (28%), 1–7 hours; in 50 (24%), 8–14 hours; and in 99 (47%), ≥15 hours.

1989

During 1989, 505 outbreaks involving 15,867 cases of foodborne diseases were reported to CDC. Reports were received from 38 states, Guam, and Puerto Rico (Figure 2). New York reported the largest number of outbreaks (141, including 14 from New York City). Hawaii reported the next largest number (40), followed by Illinois (37), Washington (29), and Wisconsin (28). The etiology was confirmed in 221 (44%) of the 505 outbreaks (Table 2).

Bacterial pathogens accounted for 171 outbreaks (6,557 cases). *Salmonella* caused most of the bacterial FBDOs (117 outbreaks, 4,920 cases) followed by *S. aureus* (14 outbreaks, 524 cases) and *C. botulinum* (13 outbreaks, 24 cases). *S.* Enteritidis caused 72 (62%) of the 117 *Salmonella* outbreaks; eggs or foods containing eggs were implicated in 18 (58%) of the 31 *S.* Enteritidis outbreaks that had a known vehicle. An outbreak in a nursing home in Maryland, caused by both *S.* Enteritidis and *S.* Schwarzengrund, resulted in 69 cases, 11 hospitalizations, and four deaths (*5*). A multistate outbreak (295 cases) of *S.* Chester infections was traced to cantaloupes imported from Mexico (*6*). A multistate outbreak (164 cases) of *S.* Javiana and *S.* Oranienberg infections was caused by mozzarella cheese that had been contaminated during shredding before it was distributed (*7*). A multistate outbreak of staphylococcal food poisoning was caused by canned mushrooms imported from China; 162 persons became ill, and 18 of these persons were hospitalized (*8*). In a restaurant in Missouri, an outbreak (101 cases) caused by *Campylobacter* apparently resulted from cross-contamination of cantaloupes, honeydew melons, and pineapples when poultry and fruit were sliced on the same surfaces. An outbreak (242 cases) caused by *C. perfringens* occurred at a

Mother's Day brunch in a hotel in New York when a seafood salad was held at room temperature for many hours.

Chemical agents accounted for 37 outbreaks (153 cases); ciguatoxin caused 19 of these outbreaks (66 cases), and scombrotoxin caused 17 (80 cases). One scombrotoxin outbreak (28 cases) in a prison was caused by eating contaminated mackerel. Four parasitic-disease outbreaks (15 cases) were caused by *T. spiralis* and one by *Giardia lamblia* (21 cases). Seven of the eight viral-disease outbreaks (329 cases) were caused by hepatitis A, including an outbreak (192 cases) caused by an infected food handler in a fast-food restaurant in Washington.

Seventeen deaths from foodborne illness were reported: 14 from *Salmonella*, two from *C. botulinum*, and one from *Listeria monocytogenes*. Eleven of the deaths caused by *Salmonella* were attributed to *S.* Enteritidis, nine of these deaths occurred in residents of nursing homes. The incubation period was reported for 231 (81%) of the 284 outbreaks that had an unknown etiology; in eight outbreaks (3%) the incubation period was <1 hour; in 40 (17%), 1–7 hours; in 43 (19%), 8–14 hours; and in 140 (61%), ≥15 hours.

1990

During 1990, 532 outbreaks involving 19,885 cases of foodborne diseases were reported to CDC. Reports were received from 45 states, the District of Columbia, Guam, and Puerto Rico (Figure 3). New York reported the largest number of outbreaks (87, including 14 from New York City). Illinois reported the next largest number of outbreaks (43), followed by Hawaii (39), Washington (33), and Ohio (29). The etiology was confirmed in 237 (45%) of the 532 outbreaks (Table 3).

Bacterial pathogens were responsible for 196 outbreaks (9,002 cases). *Salmonella* caused most of the bacterial FBDOs (136 outbreaks, 6,290 cases) followed by *S. aureus* (13 outbreaks, 372 cases) and *C. botulinum* (12 outbreaks, 22 cases). *S.* Enteritidis caused 80 (59%) of the 136 *Salmonella* outbreaks; eggs or foods containing eggs were implicated in 21 (68%) of the 31 *S.* Enteritidis outbreaks that had a known vehicle. Undercooked eggs in a bread-pudding dessert caused an outbreak of *S.* Enteritidis infections among conventioneers attending a banquet in an Illinois hotel; 1,100 persons became ill, and 147 of these persons were hospitalized. An outbreak of *S.* Agona infections among conventioneers attending a buffet catered by a South Carolina restaurant was caused by improperly handled turkey meat; 851 persons became ill and 18 of these persons were hospitalized. An outbreak of *S.* Montevideo infections apparently occurred when salad-bar ingredients were cross-contaminated by uncooked meat and poultry in a restaurant kitchen; 320 persons became ill, and eight of these persons were hospitalized. Four outbreaks involving 66 cases (20 hospitalizations) were caused by *S. typhi*; three of these outbreaks involved contamination of cold food items by infected food handlers (*9*). Improper food-handling practices resulted in two *C. perfringens* outbreaks; beef and chicken tacos were the vehicles in the outbreak (700 cases) in a Missouri prison, and prime rib was the vehicle in the outbreak (204 cases) in a Wisconsin restaurant. An outbreak (400 cases) of *S. sonnei* infections was associated with food prepared by an infected food handler at a Texas restaurant. An outbreak of *Vibrio cholerae* infections in Guam was caused by eating contaminated reef fish; 26 persons became ill, and one of these persons died.

Chemical agents accounted for 27 outbreaks (270 cases); of these 27 outbreaks, 11 were caused by scombrotoxin (194 cases), and 11 were caused by ciguatoxin (44 cases). One scombrotoxin outbreak, caused by tainted mahi-mahi, resulted in 148 cases. Two outbreaks (24 cases, one death) of paralytic shellfish poisoning were reported; one was caused by blue mussels from Rhode Island and the other by butter clams and mussels from Alaska (*10*). Five outbreaks of parasitic diseases were reported (234 cases); *G. lamblia* caused three of these outbreaks (129 cases), and *T. spiralis* caused two of them (105 cases). In one of the *G. lamblia* outbreaks, sliced raw vegetables prepared by an infected food handler were implicated (*11*). All nine viral-disease outbreaks (452 cases) were caused by hepatitis A; three deaths occurred. A multistate outbreak of hepatitis A (51 cases) was caused by frozen strawberries that were most likely contaminated by an infected employee before distribution (*12*).

Fifteen deaths from foodborne illness were reported; five from *C. botulinum*, three from hepatitis A, one from *Salmonella*, one from *V. cholerae*, one from *V. vulnificus*, one from paralytic shellfish poisoning, and three from an unknown etiology. The incubation period was reported for 241 (82%) of the 295 outbreaks that had an unknown etiology; in six outbreaks (2%) the incubation period was <1 hour; in 44 (18%), 1–7 hours; in 55 (23%), 8–14 hours; and in 136 (56%), ≥15 hours.

1991

During 1991, 528 outbreaks involving 14,876 cases of foodborne disease were reported to CDC. Reports were received from 40 states, the District of Columbia, and Guam (Figure 4). New York reported the largest number of outbreaks (115, including 35 from New York City). Washington reported the next largest number (47), followed by Illinois (42), Hawaii (36), New Jersey (35), and Pennsylvania (32). The etiology was confirmed in 214 (41%) of the 528 outbreaks (Table 4).

Bacterial pathogens accounted for 173 outbreaks (6,335 cases). *Salmonella* caused most of the bacterial FBDOs (122 outbreaks, 4,146 cases), followed by *C. botulinum* (11 outbreaks, 25 cases) and *C. perfringens* (10 outbreaks, 1,213 cases). *S.* Enteritidis caused 73 (60%) of the 122 *Salmonella* outbreaks; eggs or foods containing eggs were implicated in 17 (50%) of the 34 *S.* Enteritidis outbreaks that had a known vehicle. Inadequately cooked bread stuffing containing pooled raw eggs caused an outbreak of *S.* Enteritidis infections in a New York prison; 393 persons became ill, and nine of these persons were hospitalized. An outbreak (673 cases) of *S.* Heidelberg infections was caused by tainted chicken and beef fajitas that had been improperly stored and cooked by a food vender at a festival in Connecticut. Two outbreaks of *Salmonella* were associated with eating contaminated melons; *S.* Poona (143 cases) infections were associated with eating cantaloupes (*13*), and *S.* Javiana (39 cases) infections were associated with eating watermelon. An outbreak (600 cases) of *C. perfringens* infections was caused by improperly handled turkey meat served at a Mother's Day brunch in a Wisconsin restaurant. Three outbreaks (33 cases) were caused by *E. coli* O157:H7; one of these outbreaks (23 cases) was associated with contaminated apple cider (*14*). Two outbreaks of *V. cholerae* were caused by tainted food imported into the United States; one outbreak (four cases) was associated with frozen coconut milk imported from Thailand (*15*), and the other outbreak (two cases) was attributed to crabs that had been imported illegally from Ecuador (*16*). An outbreak (100 cases)

of Group A *Streptococcus* infections was apparently caused by an infected food handler.

Chemical agents caused 31 outbreaks (159 cases); scombrotoxin caused 17 of these outbreaks (40 cases), ciguatoxin caused seven (50 cases), and paralytic shellfish poisoning caused two (35 cases). Parasitic diseases caused three outbreaks (73 cases); *G. lamblia* caused two of these outbreaks (32 cases), and *T. spiralis* caused one of them (41 cases). All seven viral-disease outbreaks (114 cases) were caused by hepatitis A virus.

Ten deaths from foodborne illness were reported; five from *Salmonella*, two from *C. botulinum*, one from *C. perfringens*, one from paralytic shellfish poisoning, and one from an unknown etiology. Four of the *Salmonella*-associated deaths were caused by *S.* Enteritidis, and all were among residents of nursing homes. The incubation period was reported for 267 (85%) of the 314 outbreaks that had an unknown etiology; in 13 outbreaks (5%) the incubation period was <1 hour; in 67 (25%), 1–7 hours; in 60 (22%), 8–14 hours; and in 127 (48%), ≥15 hours.

1992

During 1992, 407 outbreaks involving 11,015 cases of foodborne diseases were reported to CDC. Reports were received from 35 states and Puerto Rico (Figure 5). New York reported the largest number of outbreaks (122, including 28 from New York City). Washington reported the next largest number (49), followed by California (23), Maryland (20), and New Jersey (20). The etiology was confirmed in 146 (36%) of the 407 outbreaks (Table 5).

Bacterial pathogens accounted for 117 outbreaks (4,156 cases). *Salmonella* caused most of the bacterial FBDOs (80 outbreaks, 2,834 cases) followed by *C. perfringens* (12 outbreaks, 912 cases), *S. aureus* (six outbreaks, 206 cases), and *Campylobacter* (six outbreaks, 138 cases). *S.* Enteritidis caused 60 of the *Salmonella* outbreaks; eggs or foods containing eggs were implicated in 22 (88%) of the 25 *S.* Enteritidis outbreaks that had a known vehicle. Cross-contamination of cooked foods by uncooked, pooled eggs that were used for egg batter in a New York restaurant was associated with an outbreak of *S.* Enteritidis infection; 434 became ill, and seven of these persons were hospitalized. *S.* Enteritidis was the etiologic agent in four other outbreaks: one outbreak (191 cases) in a New Jersey prison was associated with banana pudding that contained undercooked eggs; two outbreaks (130 cases)—one at a picnic in New York and one at a college in New Hampshire—were associated with eating egg sandwiches; one outbreak (105 cases) at a convention in Vermont was associated with an unidentified food vehicle. Undercooked, pooled eggs in a rice pudding also resulted in an outbreak (113 cases) of *S.* Infantis infections in a state prison in Georgia. An outbreak of *S.* Typhimurium associated with homemade ice cream containing raw eggs resulted in 31 cases and one death. An outbreak of *C. fetus* in an Ohio nursing home apparently was caused by contaminated cottage cheese; 13 residents became ill, and two of these residents died. In five outbreaks, several persons were infected by *C. perfringens* as a result of holding food at improper temperatures for several hours. These outbreaks occurred at a New York nursing home (196 cases), a Wisconsin prison (160 cases), a catered church supper in Wisconsin (120 cases), a Washington school (115 cases), and a catered family gathering in Minnesota (100 cases). *E. coli* O157:H7

caused three outbreaks; one was associated with drinking raw milk from a dairy in Oregon (six cases) and two with vehicles that were not determined (13 cases).

Chemical agents were responsible for 19 outbreaks (206 cases); scombrotoxin caused 15 of these outbreaks (135 cases). Tuna was implicated in nine of the scombrotoxin outbreaks, including an outbreak (74 cases) involving ≥20 states caused by tuna imported from Ecuador. The only parasitic-disease outbreak (two cases) was caused by *G. lamblia*. Eight viral-disease outbreaks (419 cases) were caused by hepatitis A; seven of these outbreaks, including an outbreak (230 cases) in a Wisconsin sandwich shop, were associated with infected food handlers. In several Minnesota schools, one viral-disease outbreak (250 cases) caused by a Norwalk-like virus was associated with contaminated hamburger buns and cookies that were prepared by ill food handlers at a bakery.

Eight deaths from foodborne-related illness were reported; four were caused by *Salmonella*, two by *Campylobacter fetus*, one by *C. botulinum*, and one by chemical intoxication (i.e., water-hemlock poisoning). Three of the deaths resulting from *Salmonella* infection were caused by *S.* Enteritidis and were among residents of nursing homes. The incubation period was reported for 203 (78%) of the 261 outbreaks that had an unknown etiology; in seven outbreaks (3%), this period was <1 hour; in 41 (20%), 1–7 hours; in 46 (23%), 8–14 hours; and in 109 (54%), ≥15 hours.

DISCUSSION

General Interpretation of Surveillance Data for Foodborne-Disease Outbreaks

The limitations concerning the quantity and quality of data presented in this report should be recognized. The number of FBDOs reported by this surveillance system represents only a small proportion of those that occur. The outbreaks reported also include only a fraction of the cases of foodborne disease that occur; an average of 15,475 cases (14 deaths) each year was reported by this surveillance system during 1988–1992, compared with a minimum estimate of 6 million cases per year (*17*). The likelihood of an outbreak being brought to the attention of health authorities depends on consumers' and physicians' awareness, their interest, their motivation to report the incident, and the disease-surveillance activities of state and local health and environmental agencies. For example, large outbreaks, interstate outbreaks, restaurant-associated outbreaks, and outbreaks involving serious illness, hospitalizations, or deaths are more likely to be brought to the attention of health authorities than are outbreaks of mild illness in a single family.

The quality of the data in this surveillance summary depends on the commitment to surveillance of foodborne diseases by state and local health departments, as well as other factors. A department's interest in foodborne disease and its investigative and laboratory capabilities are important determinants of the quality of any investigation. Furthermore, the likelihood that the findings of the investigation will be reported to CDC differs by the locality in which the outbreak occurs. Thus, this report should not be the basis of conclusions concerning the absolute incidence of foodborne disease or the relative incidence of foodborne diseases by specific causes. For example, food-

borne diseases characterized by short incubation periods (e.g., those caused by a chemical agent or staphylococcal enterotoxin) are more likely to be recognized as common-source FBDOs than are those diseases that have longer incubation periods (e.g., hepatitis A). Outbreaks involving less commonly identified pathogens (e.g., *B. cereus, E. coli,* or *G. lamblia)* are less likely to be confirmed because these organisms are sometimes not considered in clinical, epidemiologic, and laboratory investigations of FBDOs. Also, pathogens that usually cause mild illness will be underrepresented, whereas those causing serious illness (e.g., *C. botulinum)* are more likely to be identified and reported. Similarly, outbreaks associated with restaurants or commercial products are more likely to be reported.

Foodborne-Disease Outbreaks During 1988–1992

The annual numbers for outbreaks reported during 1988–1992 ranged from 407 to 532. When the change in the outbreak definition in 1992 is considered, these numbers were comparable with those in other recent years. During this period, both multistate outbreaks caused by contaminated produce and outbreaks caused by *E. coli* O157:H7 became more prominent. In addition, unexpected vehicles of transmission (e.g., apple cider) were described. Several outbreaks also involved imported food items, which demonstrated the complexity of modern food production and distribution.

FBDOs on cruise ships are not included in this surveillance system (*18*). FBDOs also are not included if the food is eaten outside the United States, even if the illness occurs within the United States. For example, an outbreak (75 cases) of cholera occurred among persons who ate seafood salad during an airline flight from Peru to Los Angeles; although the onset of illness began after these persons arrived in California, the outbreak was not included in this report because the salad was eaten outside the United States (*19*). Finally, disease outbreaks are not included in this surveillance system if the route of transmission from the contaminated food to the infected persons is indirect. For example, although chitterlings (i.e., pig intestines) were ultimately established as the source of *Yersinia enterocolitica* infections for several infants in Georgia in 1988, these cases are not included in this report because the infants did not eat the chitterlings; the infants apparently became infected from person-to-person contact or from an item touched by a food preparer (*20*).

The etiology was not determined for 59% of the reported outbreaks. This percentage reflects the need for improved investigative skills so that known pathogens can be recognized more readily and new pathogens can be identified. Most of the outbreaks that had an unknown etiology had an incubation period ≥15 hours, suggesting an infectious agent; many of these outbreaks may have had a viral etiology. Viruses are probably a much more important cause of disease than this report indicates. The capability of testing serum for antibody to viruses involved in FBDOs (e.g., Norwalk and Norwalk-like viruses) is not widely available and makes identification of such outbreaks difficult. Investigators have analyzed reports of FBDOs and have reported that as many as 35% of these outbreaks were probably caused by viruses (*21*).

The etiology was determined for 1,001 (41%) of the 2,423 outbreaks reported to CDC for 1988–1992; these outbreaks involved 36,890 cases. Of those outbreaks for which an etiology was determined, bacterial pathogens caused the largest percentage of outbreaks (79%) and cases (90%). Chemical agents caused 14% of outbreaks and

2% of cases; parasites, 2% of outbreaks and 1% of cases; and viruses, 4% of outbreaks and 6% of cases.

Salmonella caused 549 (69%) of the 796 bacterial FBDOs during 1988–1992; 60% of these 549 outbreaks were caused by *S.* Enteritidis. During this reporting period, an increasing number of *Salmonella* outbreaks were caused by *S.* Enteritidis (e.g., 47% in 1988 versus 75% in 1992). *S.* Enteritidis also was the most frequently reported cause of FBDOs during this period, accounting for 14% of all outbreaks and 33% of outbreaks for which an etiology was determined; most of these outbreaks for which a food vehicle could be determined were attributed to eating undercooked eggs. *S.* Enteritidis also resulted in more deaths (27) than any other pathogen; 23 (85%) of these deaths occurred among residents of nursing homes, which reflects the seriousness of *S.* Enteritidis infections in elderly persons, many of whom may be immunocompromised. Persons can decrease their risk for egg-associated infections caused by *S.* Enteritidis by not eating raw or undercooked eggs. Nursing homes, hospitals, and commercial kitchens only should use pasteurized egg products for all recipes requiring pooled or lightly cooked eggs (*22*).

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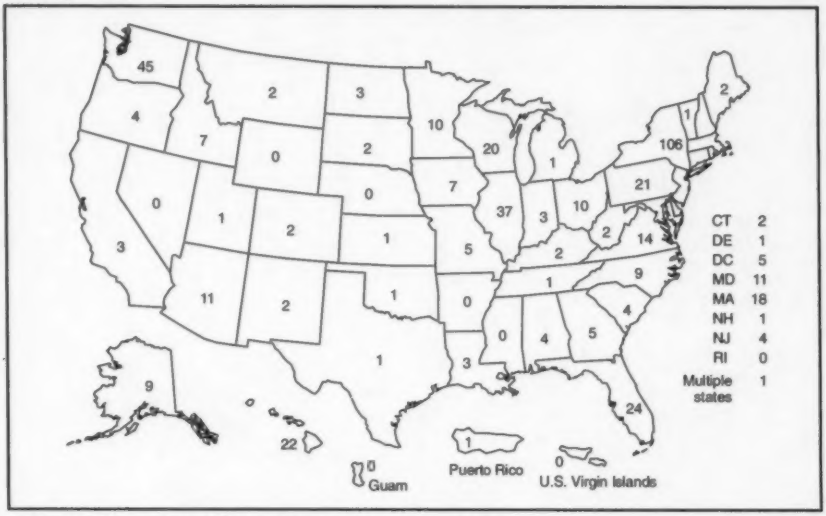
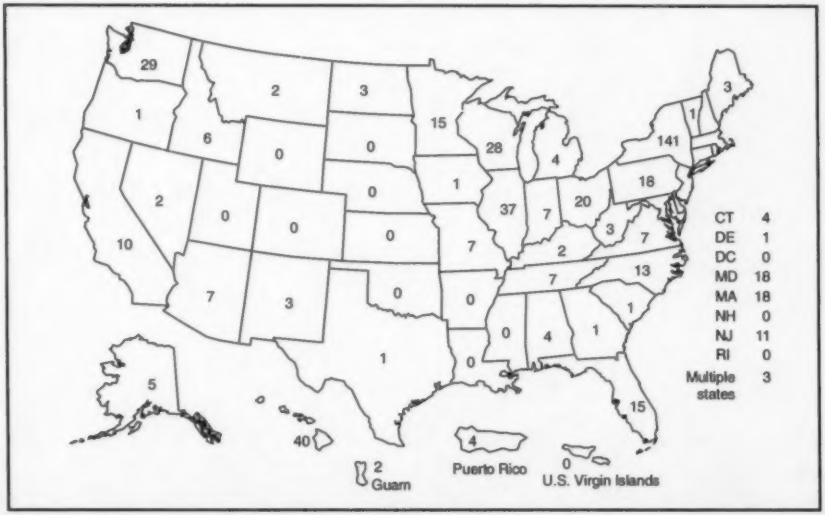
FIGURE 1. Number of reported foodborne-disease outbreaks, by state—United States,* 1988



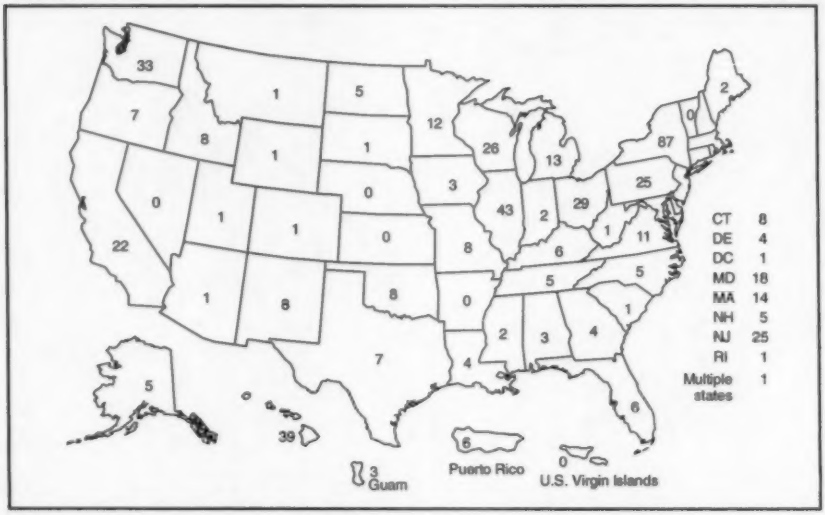
*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

FIGURE 2. Number of reported foodborne-disease outbreaks, by state—United States,* 1989



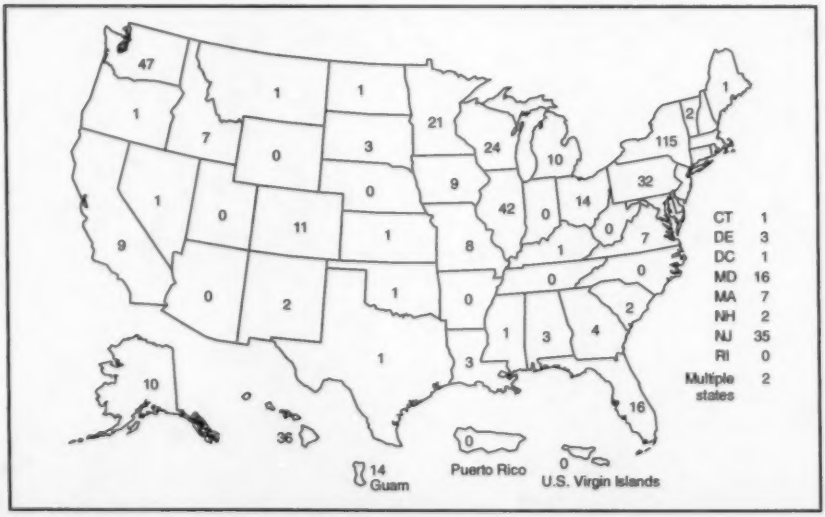
*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

FIGURE 3. Number of reported foodborne-disease outbreaks, by state—United States,* 1990



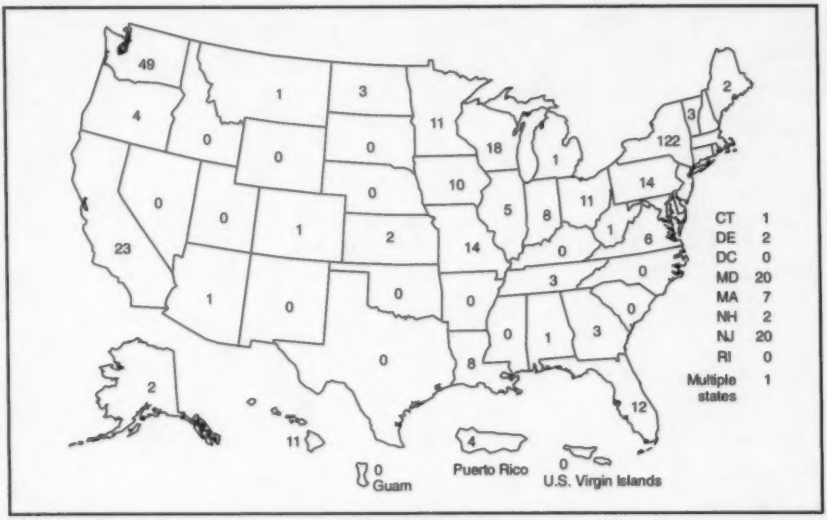
*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

FIGURE 4. Number of reported foodborne-disease outbreaks, by state—United States,* 1991



*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

FIGURE 5. Number of reported foodborne-disease outbreaks, by state—United States*, 1992



*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 1. Number of reported foodborne-disease outbreaks, cases, and deaths, by etiology—United States,* 1988

Etiology	Outbreaks No.	Outbreaks (%)	Cases No.	Cases (%)	Deaths No.	Deaths (%)
Bacterial						
Bacillus cereus	5	(1.1)	51	(0.3)	0	(0.0)
Campylobacter	4	(0.9)	134	(0.9)	0	(0.0)
Clostridium botulinum	20	(4.4)	49	(0.3)	1	(5.3)
Escherichia coli	2	(0.4)	109	(0.7)	0	(0.0)
Salmonella	94	(20.8)	2,987	(19.0)	14	(73.7)
Shigella	6	(1.3)	3,581	(22.8)	0	(0.0)
Staphylococcus aureus	8	(1.8)	245	(1.6)	0	(0.0)
Total bacterial	**139**	**(30.8)**	**7,156**	**(45.5)**	**15**	**(78.9)**
Chemical						
Ciguatoxin	4	(0.9)	8	(0.1)	0	(0.0)
Heavy metals	2	(0.4)	19	(0.1)	0	(0.0)
Mushroom poisoning	2	(0.4)	9	(0.1)	0	(0.0)
Paralytic shellfish	1	(0.2)	6	(0.0)	0	(0.0)
Scombrotoxin	16	(3.5)	65	(0.4)	1	(5.3)
Other chemical	4	(0.9)	32	(0.2)	0	(0.0)
Total chemical	**29**	**(6.4)**	**139**	**(0.9)**	**1**	**(5.3)**
Parasitic						
Trichinella spiralis	3	(0.7)	34	(0.2)	0	(0.0)
Viral						
Hepatitis A	12	(2.7)	795	(5.1)	3	(15.8)
Confirmed etiology	183	(40.6)	8,124	(51.6)	19	(100.0)
Unknown etiology	268	(59.4)	7,608	(48.4)	0	(0.0)
Total 1988	**451**	**(100.0)**	**15,732**	**(100.0)**	**19**	**(100.0)**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 2. Number of reported foodborne-disease outbreaks, cases, and deaths, by etiology—United States,* 1989

Etiology	Outbreaks		Cases		Deaths	
	No.	(%)	No.	(%)	No.	(%)
Bacterial						
Bacillus cereus	3	(0.6)	61	(0.4)	0	(0.0)
Campylobacter	8	(1.6)	295	(1.9)	0	(0.0)
Clostridium botulinum	13	(2.6)	24	(0.2)	2	(11.8)
Clostridium perfringens	7	(1.4)	436	(2.7)	0	(0.0)
Escherichia coli	1	(0.2)	3	(0.0)	0	(0.0)
Listeria monocytogenes	1	(0.2)	2	(0.0)	1	(5.9)
Salmonella	117	(23.2)	4,920	(31.0)	14	(82.4)
Shigella	6	(1.2)	257	(1.6)	0	(0.0)
Staphylococcus aureus	14	(2.8)	524	(3.3)	0	(0.0)
Streptococcus Group A	1	(0.2)	35	(0.2)	0	(0.0)
Total bacterial	**171**	**(33.9)**	**6,557**	**(41.3)**	**17**	**(100.0)**
Chemical						
Ciguatoxin	19	(3.8)	66	(0.4)	0	(0.0)
Heavy metals	1	(0.2)	7	(0.0)	0	(0.0)
Scombrotoxin	17	(3.4)	80	(0.5)	0	(0.0)
Total chemical	**37**	**(7.3)**	**153**	**(1.0)**	**0**	**(0.0)**
Parasitic						
Giardia lamblia	1	(0.2)	21	(0.1)	0	(0.0)
Trichinella spiralis	4	(0.8)	15	(0.1)	0	(0.0)
Total parasitic	**5**	**(1.0)**	**36**	**(0.2)**	**0**	**(0.0)**
Viral						
Hepatitis A	7	(1.4)	329	(2.1)	0	(0.0)
Norwalk	1	(0.2)	42	(0.3)	0	(0.0)
Total viral	**8**	**(1.6)**	**371**	**(2.3)**	**0**	**(0.0)**
Confirmed etiology	221	(43.8)	7,117	(44.9)	17	(100.0)
Unknown etiology	284	(56.2)	8,750	(55.1)	0	(0.0)
Total 1989	**505**	**(100.0)**	**15,867**	**(100.0)**	**17**	**(100.0)**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 3. Number of reported foodborne-disease outbreaks, cases, and deaths, by etiology—United States,* 1990

Etiology	Outbreaks No.	Outbreaks (%)	Cases No.	Cases (%)	Deaths No.	Deaths (%)
Bacterial						
Bacillus cereus	5	(0.9)	43	(0.2)	0	(0.0)
Campylobacter	3	(0.6)	72	(0.4)	0	(0.0)
Clostridium botulinum	12	(2.3)	22	(0.1)	5	(33.3)
Clostridium perfringens	11	(2.1)	1,240	(6.2)	0	(0.0)
Escherichia coli	2	(0.4)	80	(0.4)	0	(0.0)
Salmonella	136	(25.6)	6,290	(31.6)	1	(6.7)
Shigella	8	(1.5)	834	(4.2)	0	(0.0)
Staphylococcus aureus	13	(2.4)	372	(1.9)	0	(0.0)
Vibrio cholerae	1	(0.2)	26	(0.1)	1	(6.7)
Vibrio parahemolyticus	4	(0.8)	21	(0.1)	0	(0.0)
Vibrio vulnificus	1	(0.2)	2	(0.0)	1	(6.7)
Total bacterial	**196**	**(36.8)**	**9,002**	**(45.3)**	**8**	**(53.3)**
Chemical						
Ciguatoxin	11	(2.1)	44	(0.2)	0	(0.0)
Mushroom poisoning	1	(0.2)	5	(0.0)	0	(0.0)
Paralytic shellfish	2	(0.4)	24	(0.1)	1	(6.7)
Scombrotoxin	11	(2.1)	194	(1.0)	0	(0.0)
Other chemical	2	(0.4)	3	(0.0)	0	(0.0)
Total chemical	**27**	**(5.1)**	**270**	**(1.4)**	**1**	**(6.7)**
Parasitic						
Giardia lamblia	3	(0.6)	129	(0.6)	0	(0.0)
Trichinella spiralis	2	(0.4)	105	(0.5)	0	(0.0)
Total parasitic	**5**	**(0.9)**	**234**	**(1.2)**	**0**	**(0.0)**
Viral						
Hepatitis A	9	(1.7)	452	(2.3)	3	(20.0)
Confirmed etiology	237	(44.5)	9,958	(50.1)	12	(80.0)
Unknown etiology	295	(55.5)	9,925	(49.9)	3	(20.0)
Total 1990	**532**	**(100.0)**	**19,883**	**(100.0)**	**15**	**(100.0)**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 4. Number of reported foodborne-disease outbreaks, cases, and deaths, by etiology—United States,* 1991

Etiology	Outbreaks No.	Outbreaks (%)	Cases No.	Cases (%)	Deaths No.	Deaths (%)
Bacterial						
Bacillus cereus	5	(0.9)	253	(1.7)	0	(0.0)
Campylobacter	6	(1.1)	93	(0.6)	0	(0.0)
Clostridium botulinum	11	(2.1)	25	(0.2)	2	(20.0)
Clostridium perfringens	10	(1.9)	1,213	(8.2)	1	(10.0)
Escherichia coli	3	(0.6)	33	(0.2)	0	(0.0)
Salmonella	122	(23.1)	4,146	(27.9)	5	(50.0)
Shigella	4	(0.8)	112	(0.8)	0	(0.0)
Staphylococcus aureus	9	(1.7)	331	(2.2)	0	(0.0)
Streptococcus Group A	1	(0.2)	100	(0.7)	0	(0.0)
Vibrio cholerae	2	(0.4)	6	(0.0)	0	(0.0)
Total bacterial	**173**	**(32.8)**	**6,335**	**(42.6)**	**8**	**(80.0)**
Chemical						
Ciguatoxin	7	(1.3)	50	(0.3)	0	(0.0)
Mushroom poisoning	2	(0.4)	4	(0.0)	0	(0.0)
Paralytic shellfish	2	(0.4)	35	(0.2)	1	(10.0)
Scombrotoxin	17	(3.2)	40	(0.3)	0	(0.0)
Other chemical	3	(0.6)	30	(0.2)	0	(0.0)
Total chemical	**31**	**(5.9)**	**159**	**(1.1)**	**1**	**(10.0)**
Parasitic						
Giardia lamblia	2	(0.4)	32	(0.2)	0	(0.0)
Trichinella spiralis	1	(0.2)	41	(0.3)	0	(0.0)
Total parasitic	**3**	**(0.6)**	**73**	**(0.5)**	**0**	**(0.0)**
Viral						
Hepatitis A	7	(1.3)	114	(0.8)	0	(0.0)
Confirmed etiology	214	(40.5)	6,658	(44.8)	9	(90.0)
Unknown etiology	314	(59.5)	8,218	(55.2)	1	(10.0)
Total 1991	**528**	**(100.0)**	**14,876**	**(100.0)**	**10**	**(100.0)**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 5. Number of reported foodborne-disease outbreaks, cases, and deaths, by etiology—United States,* 1992

Etiology	Outbreaks No.	Outbreaks (%)	Cases No.	Cases (%)	Deaths No.	Deaths (%)
Bacterial						
Bacillus cereus	3	(0.7)	25	(0.2)	0	(0.0)
Campylobacter	6	(1.5)	138	(1.3)	2	(25.0)
Campylobacter/Salmonella	1	(0.2)	3	(0.0)	0	(0.0)
Clostridium botulinum	4	(1.0)	13	(0.1)	1	(12.5)
Clostridium perfringens	12	(2.9)	912	(8.3)	0	(0.0)
Escherichia coli	3	(0.7)	19	(0.2)	0	(0.0)
Salmonella	80	(19.7)	2,834	(25.7)	4	(50.0)
Shigella	1	(0.2)	4	(0.0)	0	(0.0)
Staphylococcus aureus	6	(1.5)	206	(1.9)	0	(0.0)
Vibrio cholerae	1	(0.2)	2	(0.0)	0	(0.0)
Total bacterial	**117**	**(28.7)**	**4,156**	**(37.7)**	**7**	**(87.5)**
Chemical						
Ciguatoxin	1	(0.2)	8	(0.1)	0	(0.0)
Scombrotoxin	15	(3.7)	135	(1.2)	0	(0.0)
Other chemical	3	(0.7)	63	(0.6)	1	(12.5)
Total chemical	19	(4.7)	206	(1.9)	1	(12.5)
Parasitic						
Giardia lamblia	1	(0.2)	2	(0.0)	0	(0.0)
Viral						
Hepatitis A	8	(2.0)	419	(3.8)	0	(0.0)
Norwalk-like virus	1	(0.2)	250	(2.3)	0	(0.0)
Total viral	**9**	**(2.2)**	**669**	**(6.1)**	**0**	**(0.0)**
Confirmed etiology	146	(35.9)	5,033	(45.7)	8	(100.0)
Unknown etiology	261	(64.1)	5,982	(54.3)	0	(0.0)
Total 1992	**407**	**(100.0)**	**11,015**	**(100.0)**	**8**	**(100.0)**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 6. Number of reported foodborne-disease outbreaks, by etiology and month of occurrence—United States,* 1988

Etiology	Month of occurrence												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
ETIOLOGY													
Bacterial													
Bacillus cereus	—	—	—	—	—	3	1	1	—	—	—	—	5
Campylobacter	—	—	—	—	—	3	—	—	—	1	—	—	4
Clostridium botulinum	1	1	1	1	1	6	5	—	—	2	1	1	20
Escherichia coli	—	—	—	—	1	—	—	—	—	1	—	—	2
Salmonella	3	4	2	5	10	10	12	21	12	6	6	3	94
Shigella	—	1	—	—	1	1	—	1	1	—	1	—	6
Staphylococcus aureus	—	1	1	1	—	1	—	1	—	2	1	—	8
Total bacterial	**4**	**7**	**4**	**7**	**13**	**24**	**18**	**24**	**13**	**12**	**9**	**4**	**139**
Chemical													
Ciguatoxin	—	—	1	—	—	—	1	1	—	1	—	—	4
Heavy metals	—	1	—	—	—	—	1	—	—	—	—	—	2
Mushroom poisoning	—	—	—	—	—	—	—	—	1	1	—	—	2
Paralytic shellfish	—	—	—	—	—	—	—	—	1	—	—	—	1
Scombrotoxin	1	1	—	4	—	1	2	2	2	3	—	—	16
Other chemical	—	—	1	1	1	—	—	—	—	1	—	—	4
Total chemical	**1**	**2**	**2**	**5**	**1**	**1**	**4**	**3**	**4**	**6**	**—**	**—**	**29**
Parasitic													
Trichinella spiralis	—	—	—	—	1	—	—	—	—	—	1	1	3
Viral													
Hepatitis A	2	3	—	—	—	3	1	—	1	—	1	1	12
Confirmed etiology	7	12	6	12	15	28	23	27	18	18	11	6	183
Unknown etiology	13	15	17	23	34	22	22	31	19	20	26	26	268
Total 1988	**20**	**27**	**23**	**35**	**49**	**50**	**45**	**58**	**37**	**38**	**37**	**32**	**451**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 7. Number of reported foodborne-disease outbreaks, by etiology and month of occurrence—United States,* 1989

Etiology	Month of occurrence												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Bacterial													
Bacillus cereus	1	—	—	—	1	—	1	—	—	—	—	—	3
Campylobacter	—	—	2	—	2	1	—	—	—	1	1	1	8
Clostridium botulinum	—	1	1	—	2	3	3	—	—	3	—	—	13
Clostridium perfringens	—	—	—	1	1	2	1	—	—	—	—	2	7
Escherichia coli	—	—	—	—	—	—	—	1	—	—	—	—	1
Listeria monocytogenes	—	—	—	—	—	1	—	—	—	—	—	—	1
Salmonella	1	2	3	4	14	20	21	8	18	13	9	4	117
Shigella	—	1	—	—	2	—	2	—	—	1	—	—	6
Staphylococcus aureus	—	3	2	1	2	2	1	—	1	—	—	2	14
Streptococcus Group A	—	—	—	—	—	—	—	—	1	—	—	—	1
Total bacterial	**2**	**7**	**8**	**6**	**24**	**29**	**29**	**9**	**20**	**18**	**10**	**9**	**171**
Chemical													
Ciguatoxin	—	—	2	—	1	4	4	2	—	4	1	1	19
Heavy metals	—	—	—	—	—	—	—	—	—	1	—	—	1
Mushroom poisoning	—	—	—	—	—	—	—	—	—	—	—	—	—
Scombrotoxin	1	2	1	3	—	1	—	4	3	—	1	1	17
Total chemical	**1**	**2**	**3**	**3**	**1**	**5**	**4**	**6**	**3**	**5**	**2**	**2**	**37**
Parasitic													
Giardia lamblia	—	—	1	—	—	—	—	—	—	—	—	—	1
Trichinella spiralis	—	—	—	—	—	3	—	—	—	—	1	—	4
Total parasitic	—	—	1	—	—	3	—	—	—	—	1	—	5
Viral													
Hepatitis A	—	—	—	—	1	—	—	1	1	3	—	1	7
Norwalk	1	—	—	—	—	—	—	—	—	—	—	—	1
Total viral	**1**	**—**	**—**	**—**	**1**	**—**	**—**	**1**	**1**	**3**	**—**	**1**	**8**
Confirmed etiology	4	9	12	9	26	37	33	16	24	26	13	12	221
Unknown etiology	17	11	27	31	36	33	21	22	18	18	13	37	284
Total 1989	**21**	**20**	**39**	**40**	**62**	**70**	**54**	**38**	**42**	**44**	**26**	**49**	**505**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 8. Number of reported foodborne-disease outbreaks, by etiology and month of occurrence—United States,* 1990

Etiology	Month of occurrence												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Bacterial													
Bacillus cereus	—	—	1	—	—	—	2	—	—	1	—	1	5
Campylobacter	—	—	1	—	1	—	—	—	1	—	—	—	3
Clostridium botulinum	1	—	—	1	—	1	2	1	2	3	1	—	12
Clostridium perfringens	1	1	1	2	1	1	—	—	—	—	4	—	11
Escherichia coli	—	—	—	—	—	—	1	—	—	—	1	—	2
Salmonella	5	7	6	7	16	23	20	13	14	15	4	6	136
Shigella	—	—	—	1	—	2	1	1	1	1	1	—	8
Staphylococcus aureus	1	1	—	1	3	2	3	1	1	—	—	—	13
Vibrio cholerae	—	—	—	—	1	—	—	—	—	—	—	—	1
Vibrio parahemolyticus	—	—	—	—	—	—	2	2	—	—	—	—	4
Vibrio vulnificus	—	—	—	1	—	—	—	—	—	—	—	—	1
Total bacterial	**8**	**9**	**9**	**13**	**22**	**29**	**31**	**18**	**19**	**20**	**11**	**7**	**196**
Chemical													
Ciguatoxin	2	—	1	—	—	1	—	1	3	—	2	1	11
Mushroom poisoning	—	—	—	—	—	1	—	—	—	—	—	—	1
Paralytic shellfish	—	—	—	—	2	—	—	—	—	—	—	—	2
Scombrotoxin	—	—	1	1	1	2	1	1	1	1	2	—	11
Other chemical	—	—	—	1	—	—	1	—	—	—	—	—	2
Total chemical	**2**	**—**	**2**	**2**	**3**	**4**	**2**	**2**	**4**	**1**	**4**	**1**	**27**
Parasitic													
Giardia lamblia	—	—	—	—	—	—	1	1	—	—	1	—	3
Trichinella spiralis	—	—	—	—	—	—	1	—	—	—	1	—	2
Total parasitic	**—**	**—**	**—**	**—**	**—**	**—**	**2**	**1**	**—**	**—**	**2**	**—**	**5**
Viral													
Hepatitis A	—	—	2	1	1	2	—	1	—	1	—	1	9
Confirmed etiology	10	9	13	16	26	35	35	22	23	22	17	9	237
Unknown etiology	16	14	23	23	36	35	21	31	32	20	24	20	295
Total 1990	**26**	**23**	**36**	**39**	**62**	**70**	**56**	**53**	**55**	**42**	**41**	**29**	**532**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 9. Number of reported foodborne-disease outbreaks, by etiology and month of occurrence—United States,* 1991

Etiology	Month of occurrence												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Bacterial													
Bacillus cereus	—	—	—	1	1	—	1	1	—	—	—	1	5
Campylobacter	—	—	—	1	1	—	2	—	—	1	—	1	6
Clostridium botulinum	1	—	—	—	1	2	1	1	2	2	—	1	11
Clostridium perfringens	—	—	—	1	3	—	2	—	—	1	1	2	10
Escherichia coli	—	—	—	—	—	—	—	1	1	1	—	—	3
Salmonella	4	1	5	7	16	13	25	18	11	12	6	4	122
Shigella	—	—	—	—	1	—	—	2	1	—	—	—	4
Staphylococcus aureus	—	—	2	1	—	2	2	—	—	1	1	—	9
Streptococcus Group A	—	—	—	—	1	—	—	—	—	—	—	—	1
Vibrio cholerae	—	—	—	1	—	—	—	1	—	—	—	—	2
Total bacterial	**5**	**1**	**7**	**12**	**24**	**17**	**33**	**24**	**15**	**18**	**8**	**9**	**173**
Chemical													
Ciguatoxin	—	—	—	1	—	1	1	2	2	—	—	—	7
Mushroom poisoning	—	—	1	—	—	—	—	—	—	—	1	—	2
Paralytic shellfish	—	—	—	—	—	1	—	—	—	—	1	—	2
Scombrotoxin	1	—	—	—	1	1	3	3	2	2	4	—	17
Other chemical	—	—	—	1	—	—	—	—	1	—	—	1	3
Total chemical	**1**	**—**	**1**	**2**	**1**	**3**	**4**	**5**	**5**	**2**	**6**	**1**	**31**
Parasitic													
Giardia lamblia	—	—	1	—	—	—	1	—	—	—	—	—	2
Trichinella spiralis	—	1	—	—	—	—	—	—	—	—	—	—	1
Total parasitic	**—**	**1**	**1**	**—**	**—**	**—**	**1**	**—**	**—**	**—**	**—**	**—**	**3**
Viral													
Hepatitis A	1	1	1	1	2	—	—	—	—	—	1	—	7
Confirmed etiology	7	3	10	15	27	20	38	29	20	20	15	10	214
Unknown etiology	24	23	14	20	32	37	31	20	25	24	31	33	314
Total 1991	**31**	**26**	**24**	**35**	**59**	**57**	**69**	**49**	**45**	**44**	**46**	**43**	**528**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 10. Number of reported foodborne-disease outbreaks, by etiology and month of occurrence—United States,* 1992

Etiology	Month of occurrence												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Bacterial													
Bacillus cereus	—	—	2	—	—	—	—	—	—	—	—	1	3
Campylobacter	—	1	—	1	2	—	—	—	1	—	—	1	6
Campylobacter/Salmonella	—	—	—	—	—	1	—	—	—	—	—	—	1
Clostridium botulinum	—	1	—	—	1	—	—	2	—	—	—	—	4
Clostridium perfringens	—	1	3	1	2	—	—	1	1	1	—	2	12
Escherichia coli	—	—	—	—	1	—	1	—	—	—	—	1	3
Salmonella	2	3	2	6	6	8	15	12	9	6	7	4	80
Shigella	—	—	—	—	—	—	—	—	—	1	—	—	1
Staphylococcus aureus	—	—	1	1	1	—	1	—	1	—	—	1	6
Vibrio cholerae	—	1	—	—	—	—	—	—	—	—	—	—	1
Total bacterial	**2**	**6**	**8**	**10**	**13**	**9**	**17**	**15**	**12**	**8**	**7**	**10**	**117**
Chemical													
Ciguatoxin	—	—	—	—	—	1	—	—	—	—	—	—	1
Scombrotoxin	—	2	2	1	3	1	1	1	2	2	—	—	15
Other chemical	—	—	—	—	1	—	—	—	—	1	—	1	3
Total chemical	**—**	**2**	**2**	**1**	**4**	**2**	**1**	**1**	**2**	**3**	**—**	**1**	**19**
Parasitic													
Giardia lamblia	—	—	—	—	—	—	—	—	—	—	—	1	1
Viral													
Hepatitis A	2	—	1	—	—	2	—	—	—	1	2	—	8
Norwalk-like virus	—	—	—	—	—	—	—	—	—	—	1	—	1
Total viral	**2**	**—**	**1**	**—**	**—**	**2**	**—**	**—**	**—**	**1**	**3**	**—**	**9**
Confirmed etiology	4	8	11	11	17	13	18	16	14	12	10	12	146
Unknown etiology	17	24	24	30	25	21	18	20	17	15	21	29	261
Total 1992	**21**	**32**	**35**	**41**	**42**	**34**	**36**	**36**	**31**	**27**	**31**	**41**	**407**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 11. Number of reported foodborne-disease outbreaks, by etiology and place where food was eaten—United States,* 1988

Etiology	Place where food was eaten							Total place known	Total place unknown	Total
	Private residence	Delicatessen, cafeteria, or restaurant	School	Picnic	Church	Camp	Other			
Bacterial										
Bacillus cereus	—	3	—	—	1	—	1	5	—	5
Campylobacter	—	2	1	1	—	—	—	4	—	4
Clostridium botulinum	3	—	—	—	—	—	—	3	17	20
Escherichia coli	—	—	2	—	—	—	—	2	—	2
Salmonella	17	41	6	4	1	—	25	94	—	94
Shigella	1	1	1	—	—	—	2	5	1	6
Staphylococcus aureus	—	5	1	—	—	—	2	8	—	8
Total bacterial	**21**	**52**	**11**	**5**	**2**	**—**	**30**	**121**	**18**	**139**
Chemical										
Ciguatoxin	3	—	—	—	—	—	—	3	1	4
Heavy metals	—	2	—	—	—	—	—	2	—	2
Mushroom poisoning	1	—	—	—	—	—	—	1	1	2
Paralytic shellfish	—	—	—	—	—	—	1	1	—	1
Scombrotoxin	1	14	—	—	—	—	—	15	1	16
Other chemical	3	1	—	—	—	—	—	4	—	4
Total chemical	**8**	**17**	**—**	**—**	**—**	**—**	**1**	**26**	**3**	**29**
Parasitic										
Trichinella spiralis	—	—	—	—	—	—	2	11	1	12
Viral										
Hepatitis A	—	9	—	—	—	—	2	11	1	12
Confirmed etiology	29	78	11	5	2	—	34	159	24	183
Unknown etiology	50	128	14	3	4	3	56	258	10	268
Total 1988	**79**	**206**	**25**	**8**	**6**	**3**	**90**	**417**	**34**	**451**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 12. Number of reported foodborne-disease outbreaks, by etiology and place where food was eaten—United States,* 1989

Etiology	Place where food was eaten							Total place known	Total place unknown	Total
	Private residence	Delicatessen, cafeteria, or restaurant	School	Picnic	Church	Camp	Other			
Bacterial										
Bacillus cereus	1	1	—	—	—	—	1	3	—	3
Campylobacter	2	2	—	1	—	—	3	8	—	8
Clostridium botulinum	9	—	—	—	—	—	—	9	4	13
Clostridium perfringens	1	4	1	—	—	—	1	7	—	7
Escherichia coli	—	1	—	—	—	—	—	1	—	1
Listeria monocytogenes	1	—	—	—	—	—	—	1	—	1
Salmonella	11	43	2	—	1	2	51	110	7	117
Shigella	—	2	—	—	—	—	4	6	—	6
Staphylococcus aureus	3	1	1	—	—	—	9	14	—	14
Streptococcus Group A	—	—	—	—	—	—	1	1	—	1
Total bacterial	**28**	**54**	**4**	**1**	**1**	**2**	**70**	**160**	**11**	**171**
Chemical										
Ciguatoxin	16	3	—	—	—	—	—	19	—	19
Heavy metals	1	—	—	—	—	—	—	1	—	1
Scombrotoxin	—	14	—	—	—	—	3	17	—	17
Total chemical	**17**	**17**	**—**	**—**	**—**	**—**	**3**	**37**	**—**	**37**
Parasitic										
Giardia lamblia	—	—	—	—	1	—	—	1	—	1
Trichinella spiralis	—	—	—	—	—	—	—	—	4	4
Total parasitic	**—**	**—**	**—**	**—**	**1**	**—**	**—**	**1**	**4**	**5**
Viral										
Hepatitis A	1	3	—	—	1	—	2	7	—	7
Norwalk	—	1	—	—	—	—	—	1	—	1
Total viral	**1**	**4**	**—**	**—**	**1**	**—**	**2**	**8**	**—**	**8**
Confirmed etiology	46	75	4	1	3	2	75	206	15	221
Unknown etiology	43	137	17	2	8	7	67	281	3	284
Total 1989	**89**	**212**	**21**	**3**	**11**	**9**	**142**	**487**	**18**	**505**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 13. Number of reported foodborne-disease outbreaks, by etiology and place where food was eaten—United States,* 1990

Etiology	Place where food was eaten							Total place known	Total place unknown	Total
	Private residence	Delicatessen, cafeteria, or restaurant	School	Picnic	Church	Camp	Other			
Bacterial										
Bacillus cereus	1	2	—	—	—	—	2	5	—	5
Campylobacter	—	—	1	—	—	—	2	3	—	3
Clostridium botulinum	9	—	—	—	—	—	—	9	3	12
Clostridium perfringens	1	2	2	1	1	—	4	11	—	11
Escherichia coli	—	—	1	—	—	—	1	2	—	2
Salmonella	15	51	5	5	3	1	55	135	1	136
Shigella	—	3	—	—	—	—	5	8	—	8
Staphylococcus aureus	2	4	2	—	—	—	5	13	—	13
Vibrio cholerae	1	—	—	—	—	—	—	1	—	1
Vibrio parahemolyticus	1	2	—	—	—	—	1	4	—	4
Vibrio vulnificus	—	1	—	—	—	—	—	1	—	1
Total bacterial	**30**	**65**	**11**	**6**	**4**	**1**	**75**	**192**	**4**	**196**
Chemical										
Ciguatoxin	7	3	—	—	—	—	1	11	—	11
Mushroom poisoning	1	—	—	—	—	—	—	1	—	1
Paralytic shellfish	—	—	—	—	—	—	2	2	—	2
Scombrotoxin	3	7	—	—	—	—	1	11	—	11
Other chemical	1	—	—	—	—	—	1	2	—	2
Total chemical	**12**	**10**	**—**	**—**	**—**	**—**	**5**	**27**	**—**	**27**
Parasitic										
Giardia lamblia	—	1	—	—	—	—	2	3	—	3
Trichinella spiralis	1	—	—	—	—	—	1	2	—	2
Total parasitic	**1**	**1**	**—**	**—**	**—**	**—**	**3**	**5**	**—**	**5**
Viral										
Hepatitis A	1	5	—	—	—	—	2	8	1	9
Confirmed etiology	44	81	11	6	4	1	85	232	5	237
Unknown etiology	59	113	12	7	5	4	93	293	2	295
Total 1990	**103**	**194**	**23**	**13**	**9**	**5**	**178**	**525**	**7**	**532**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 14. Number of reported foodborne-disease outbreaks, by etiology and place where food was eaten—United States,* 1991

Etiology	Place where food was eaten							Total place known	Total place unknown	Total
	Private residence	Delicatessen, cafeteria, or restaurant	School	Picnic	Church	Camp	Other			
Bacterial										
Bacillus cereus	2	1	—	—	—	—	2	5	—	5
Campylobacter	—	3	—	—	—	1	2	6	—	6
Clostridium botulinum	3	—	—	—	—	—	—	3	8	11
Clostridium perfringens	1	4	—	—	—	—	5	10	—	10
Escherichia coli	1	—	—	1	—	—	1	3	—	3
Salmonella	14	47	3	2	2	4	47	119	3	122
Shigella	2	—	—	—	—	—	2	4	—	4
Staphylococcus aureus	2	1	—	—	—	1	5	9	—	9
Streptococcus Group A	—	—	—	—	—	—	1	1	—	1
Vibrio cholerae	1	—	—	—	—	—	1	2	—	2
Total bacterial	**26**	**56**	**3**	**3**	**2**	**6**	**66**	**162**	**11**	**173**
Chemical										
Ciguatoxin	5	1	—	—	—	—	1	7	—	7
Mushroom poisoning	1	—	—	—	—	—	1	2	—	2
Paralytic shellfish	2	—	—	—	—	—	—	2	—	2
Scombrotoxin	4	10	—	—	—	—	2	16	—	16
Other chemical	1	1	1	—	—	—	—	3	—	3
Total chemical	**13**	**12**	**1**	**—**	**—**	**—**	**4**	**30**	**—**	**30**
Parasitic										
Giardia lamblia	—	1	—	—	—	—	1	2	—	2
Trichinella spiralis	1	—	—	—	—	—	—	1	—	1
Total parasitic	**1**	**1**	**—**	**—**	**—**	**—**	**1**	**3**	**—**	**3**
Viral										
Hepatitis A	—	3	2	—	—	—	2	7	1	8
Confirmed etiology	40	72	6	3	2	6	73	202	12	214
Unknown etiology	63	138	9	4	10	2	80	306	8	314
Total 1991	**103**	**210**	**15**	**7**	**12**	**8**	**153**	**508**	**20**	**528**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 15. Number of reported foodborne-disease outbreaks, by etiology and place where food was eaten—United States,* 1992

Etiology	Place where food was eaten							Total place known	Total place unknown	Total
	Private residence	Delicatessen, cafeteria, or restaurant	School	Picnic	Church	Camp	Other			
Bacterial										
Bacillus cereus	—	2	—	—	—	—	1	3	—	3
Campylobacter	1	—	—	—	1	—	3	5	1	6
Campylobacter/Salmonella	1	—	—	—	—	—	—	1	—	1
Clostridium botulinum	2	—	—	—	—	—	—	2	2	4
Clostridium perfringens	—	2	2	—	1	—	7	12	—	12
Escherichia coli	—	1	—	—	—	—	1	2	1	3
Salmonella	15	27	—	3	—	—	34	79	1	80
Shigella	—	1	—	—	—	—	—	1	—	1
Staphylococcus aureus	—	1	1	—	—	—	4	6	—	6
Vibrio cholerae	1	—	—	—	—	—	—	1	—	1
Total bacterial	**20**	**34**	**3**	**3**	**2**	**—**	**50**	**112**	**5**	**117**
Chemical										
Ciguatoxin	1	—	—	—	—	—	—	1	—	1
Scombrotoxin	4	6	—	—	—	—	5	15	—	15
Other chemical	—	1	—	—	—	—	2	3	—	3
Total chemical	**5**	**7**	**—**	**—**	**—**	**—**	**7**	**19**	**—**	**19**
Parasitic										
Giardia lamblia	—	1	—	—	—	—	—	1	—	1
Viral										
Hepatitis A	—	3	1	—	—	—	3	7	1	8
Norwalk-like virus	—	—	1	—	—	—	—	1	—	1
Total viral	**—**	**3**	**2**	**—**	**—**	**—**	**3**	**8**	**1**	**9**
Confirmed etiology	25	45	5	3	2	—	60	140	6	146
Unknown etiology	48	106	10	—	5	3	85	257	4	261
Total 1992	**73**	**151**	**15**	**3**	**7**	**3**	**145**	**397**	**10**	**407**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 16. Number of reported foodborne-disease outbreaks, cases, and deaths, by vehicle of transmission—United States,* 1988

Etiology	Outbreaks		Cases		Deaths	
	No.	(%)	No.	(%)	No.	(%)
Baked foods	2	(0.4)	15	(0.1)	0	(0.0)
Beef	16	(3.5)	513	(3.3)	0	(0.0)
Chicken	7	(1.6)	130	(0.8)	0	(0.0)
Chinese food	4	(0.9)	84	(0.5)	0	(0.0)
Eggs	7	(1.6)	294	(1.9)	2	(10.5)
Fruits and vegetables	14	(3.1)	374	(2.4)	3	(15.8)
Ham	5	(1.1)	116	(0.7)	0	(0.0)
Ice cream	6	(1.3)	163	(1.0)	0	(0.0)
Mexican food	2	(0.4)	15	(0.1)	0	(0.0)
Milk	1	(0.2)	120	(0.8)	0	(0.0)
Multiple vehicles	66	(14.6)	3,309	(21.0)	8	(42.1)
Mushrooms	2	(0.4)	9	(0.1)	0	(0.0)
Nondairy beverage	7	(1.6)	1,070	(6.8)	0	(0.0)
Other fish	27	(6.0)	225	(1.4)	1	(5.3)
Other salad	11	(2.4)	3,636	(23.1)	0	(0.0)
Other/unknown meat	8	(1.8)	57	(0.4)	1	(5.3)
Pork	4	(0.9)	326	(2.1)	0	(0.0)
Potato salad	4	(0.9)	190	(1.2)	0	(0.0)
Poultry, fish, or egg salad	5	(1.1)	147	(0.9)	0	(0.0)
Sausage	1	(0.2)	8	(0.1)	0	(0.0)
Shellfish	3	(0.7)	87	(0.6)	0	(0.0)
Turkey	4	(0.9)	272	(1.7)	1	(5.3)
Confirmed vehicle	206	(45.7)	11,160	(70.9)	16	(84.2)
Unknown vehicle	245	(54.3)	4,572	(29.1)	3	(15.8)
Total 1988	**451**	**(100.0)**	**15,732**	**(100.0)**	**19**	**(100.0)**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 17. Number of reported foodborne-disease outbreaks, cases, and deaths, by vehicle of transmission—United States,* 1989

Etiology	Outbreaks		Cases		Deaths	
	No.	(%)	No.	(%)	No.	(%)
Baked foods	3	(0.6)	84	(0.5)	1	(4.3)
Beef	12	(2.4)	489	(3.0)	0	(0.0)
Cheese	1	(0.2)	164	(1.0)	0	(0.0)
Chicken	9	(1.8)	225	(1.4)	0	(0.0)
Chinese food	6	(1.2)	45	(0.3)	0	(0.0)
Eggs	3	(0.6)	74	(0.5)	0	(0.0)
Fruits and vegetables	21	(4.2)	1,072	(6.8)	0	(0.0)
Ham	6	(1.2)	602	(3.8)	0	(0.0)
Ice cream	1	(0.2)	16	(0.1)	0	(0.0)
Mexican food	7	(1.4)	360	(2.3)	0	(0.0)
Milk	3	(0.6)	48	(0.3)	0	(0.0)
Multiple vehicles	75	(14.9)	3,904	(24.6)	2	(8.7)
Mushrooms	1	(0.2)	162	(1.0)	0	(0.0)
Nondairy beverage	2	(0.4)	87	(0.5)	0	(0.0)
Other fish	39	(7.7)	200	(1.3)	0	(0.0)
Other salad	17	(3.4)	560	(3.5)	1	(4.3)
Other/unknown dairy	1	(0.2)	22	(0.1)	0	(0.0)
Other/unknown meat	8	(1.6)	40	(0.3)	1	(4.3)
Potato salad	3	(0.6)	207	(1.3)	0	(0.0)
Poultry, fish, or egg salad	3	(0.6)	82	(0.5)	0	(0.0)
Sausage	2	(0.4)	12	(0.1)	0	(0.0)
Shellfish	8	(1.6)	273	(1.7)	0	(0.0)
Turkey	6	(1.2)	154	(1.0)	0	(0.0)
Confirmed vehicle	237	(46.9)	8,882	(56.0)	5	(21.7)
Unknown vehicle	268	(53.1)	6,985	(44.0)	18	(78.3)
Total 1989	**505**	**(100.0)**	**15,867**	**(100.0)**	**23**	**(100.0)**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 18. Number of reported foodborne-disease outbreaks, cases, and deaths, by vehicle of transmission—United States,* 1990

Etiology	Outbreaks		Cases		Deaths	
	No.	(%)	No.	(%)	No.	(%)
Baked foods	7	(1.3)	111	(0.6)	0	(0.0)
Beef	13	(2.4)	507	(2.5)	0	(0.0)
Carbonated drinks	2	(0.4)	19	(0.1)	0	(0.0)
Cheese	3	(0.6)	50	(0.3)	0	(0.0)
Chicken	7	(1.3)	396	(2.0)	0	(0.0)
Chinese food	5	(0.9)	33	(0.2)	0	(0.0)
Eggs	5	(0.9)	381	(1.9)	0	(0.0)
Fruits and vegetables	15	(2.8)	602	(3.0)	5	(33.3)
Ham	4	(0.8)	109	(0.5)	0	(0.0)
Ice cream	6	(1.1)	148	(0.7)	0	(0.0)
Mexican food	10	(1.9)	976	(4.9)	0	(0.0)
Milk	3	(0.6)	68	(0.3)	0	(0.0)
Multiple vehicles	79	(14.8)	4,626	(23.3)	2	(13.3)
Mushrooms	1	(0.2)	5	(0.0)	0	(0.0)
Other fish	31	(5.8)	451	(2.3)	2	(13.3)
Other salad	20	(3.8)	1,444	(7.3)	0	(0.0)
Other/unknown dairy	1	(0.2)	40	(0.2)	0	(0.0)
Other/unknown meat	2	(0.4)	20	(0.1)	0	(0.0)
Pork	3	(0.6)	142	(0.7)	0	(0.0)
Potato salad	1	(0.2)	40	(0.2)	0	(0.0)
Poultry, fish, or egg salad	6	(1.1)	272	(1.4)	0	(0.0)
Sausage	1	(0.2)	1	(0.0)	0	(0.0)
Shellfish	11	(2.1)	153	(0.8)	2	(13.3)
Turkey	6	(1.1)	1,094	(5.5)	0	(0.0)
Confirmed vehicle	242	(45.5)	11,688	(58.8)	11	(73.3)
Unknown vehicle	290	(54.5)	8,195	(41.2)	4	(26.7)
Total 1990	**532**	**(100.0)**	**19,883**	**(100.0)**	**15**	**(100.0)**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 19. Number of reported foodborne-disease outbreaks, cases, and deaths, by vehicle of transmission—United States,* 1991

Etiology	Outbreaks		Cases		Deaths	
	No.	(%)	No.	(%)	No.	(%)
Baked foods	11	(2.1)	506	(3.4)	0	(0.0)
Beef	13	(2.5)	326	(2.2)	0	(0.0)
Carbonated drinks	1	(0.2)	1	(0.0)	0	(0.0)
Cheese	1	(0.2)	25	(0.2)	0	(0.0)
Chicken	10	(1.9)	308	(2.1)	0	(0.0)
Chinese food	4	(0.8)	111	(0.7)	0	(0.0)
Eggs	2	(0.4)	17	(0.1)	0	(0.0)
Fruits and vegetables	12	(2.3)	308	(2.1)	1	(10.0)
Ham	2	(0.4)	56	(0.4)	0	(0.0)
Ice cream	4	(0.8)	62	(0.4)	0	(0.0)
Mexican food	7	(1.3)	1,774	(11.9)	0	(0.0)
Milk	1	(0.2)	37	(0.2)	0	(0.0)
Multiple vehicles	81	(15.3)	4,386	(29.5)	1	(10.0)
Mushrooms	2	(0.4)	4	(0.0)	0	(0.0)
Nondairy beverage	3	(0.6)	120	(0.8)	0	(0.0)
Other fish	29	(5.5)	114	(0.8)	0	(0.0)
Other salad	17	(3.2)	610	(4.1)	0	(0.0)
Other/unknown dairy	2	(0.4)	23	(0.2)	0	(0.0)
Other/unknown meat	9	(1.7)	132	(0.9)	2	(20.0)
Pork	3	(0.6)	223	(1.5)	0	(0.0)
Potato salad	2	(0.4)	80	(0.5)	0	(0.0)
Poultry, fish, or egg salad	3	(0.6)	237	(1.6)	0	(0.0)
Sausage	1	(0.2)	41	(0.3)	0	(0.0)
Shellfish	7	(1.3)	72	(0.5)	1	(10.0)
Turkey	9	(1.7)	854	(5.7)	0	(0.0)
Confirmed vehicle	236	(44.6)	10,427	(70.1)	5	(50.0)
Unknown vehicle	293	(55.4)	4,449	(29.9)	5	(50.0)
Total 1991	**529**	**(100.0)**	**14,876**	**(100.0)**	**10**	**(100.0)**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 20. Number of reported foodborne-disease outbreaks, cases, and deaths, by vehicle of transmission—United States,* 1992

Etiology	Outbreaks No.	Outbreaks (%)	Cases No.	Cases (%)	Deaths No.	Deaths (%)
Baked foods	6	(1.5)	104	(0.9)	0	(0.0)
Beef	9	(2.2)	250	(2.3)	0	(0.0)
Chicken	7	(1.7)	535	(4.9)	0	(0.0)
Chinese food	2	(0.5)	13	(0.1)	0	(0.0)
Eggs	3	(0.7)	486	(4.4)	0	(0.0)
Fruits and vegetables	2	(0.5)	92	(0.8)	0	(0.0)
Ham	2	(0.5)	65	(0.6)	0	(0.0)
Ice cream	3	(0.7)	81	(0.7)	1	(12.5)
Mexican food	8	(2.0)	315	(2.9)	0	(0.0)
Milk	3	(0.7)	79	(0.7)	0	(0.0)
Multiple vehicles	54	(13.3)	2,580	(23.4)	2	(25.0)
Nondairy beverage	1	(0.2)	8	(0.1)	0	(0.0)
Other fish	20	(4.9)	382	(3.5)	0	(0.0)
Other salad	11	(2.7)	381	(3.5)	0	(0.0)
Other/unknown dairy	1	(0.2)	12	(0.1)	0	(0.0)
Other/unknown meat	3	(0.7)	218	(2.0)	0	(0.0)
Potato salad	3	(0.7)	58	(0.5)	0	(0.0)
Poultry, fish, or egg salad	5	(1.2)	441	(4.0)	1	(12.5)
Shellfish	5	(1.2)	94	(0.9)	0	(0.0)
Turkey	3	(0.7)	124	(1.1)	0	(0.0)
Confirmed vehicle	151	(37.1)	6,318	(57.4)	4	(50.0)
Unknown vehicle	256	(62.9)	4,697	(42.6)	4	(50.0)
Total 1992	**407**	**(100.0)**	**11,015**	**(100.0)**	**8**	**(100.0)**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 21. Number of reported foodborne-disease outbreaks, by etiology and vehicle of transmission—United States,* 1988

Etiology	Vehicle of transmission									
	Beef	Ham	Pork	Sausage	Chicken	Turkey	Other meats and stews	Shellfish	Other fish	Milk
Bacterial										
Bacillus cereus	—	—	—	—	—	—	—	—	1	—
Campylobacter	—	—	—	—	—	—	—	—	—	1
Clostridium botulinum	—	—	—	—	—	—	4	—	2	—
Escherichia coli	2	—	—	—	—	—	—	—	—	—
Salmonella	6	2	3	—	2	1	1	—	2	—
Shigella	—	—	—	—	—	—	—	—	—	—
Staphylococcus aureus	1	3	—	—	—	1	—	—	—	—
Total bacterial	**9**	**5**	**3**	**—**	**2**	**2**	**5**	**—**	**5**	**1**
Chemical										
Ciguatoxin	—	—	—	—	—	—	—	—	4	—
Heavy metals	—	—	—	—	—	—	—	—	—	—
Mushroom poisoning	—	—	—	—	—	—	—	—	—	—
Paralytic shellfish	—	—	—	—	—	—	—	1	—	—
Scombrotoxin	—	—	—	—	—	—	—	—	16	—
Other chemical	—	—	—	—	—	—	—	—	—	—
Total chemical	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**1**	**20**	**—**
Parasitic										
Trichinella spiralis	—	—	—	—	—	—	2	—	—	—
Viral										
Hepatitis A	—	—	—	—	—	—	—	1	—	—
Confirmed etiology	9	5	3	—	2	2	7	2	25	1
Unknown etiology	7	—	1	1	5	2	1	1	2	—
Total 1988	**16**	**5**	**4**	**1**	**7**	**4**	**8**	**3**	**27**	**1**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 21. Number of reported foodborne-disease outbreaks, by etiology and vehicle of transmission—United States,* 1988, continued

Etiology	Vehicle of transmission									
	Cheese	Eggs	Ice cream	Other/ multiple dairy	Baked foods	Fruits and vegetables	Potato salad	Poultry, fish, egg salad	Other salad	Chinese food
Bacterial										
Bacillus cereus	—	—	—	—	—	—	—	1	—	3
Campylobacter	—	—	—	—	—	—	—	—	—	—
Clostridium botulinum	—	—	—	—	—	8	1	—	—	—
Escherichia coli	—	—	—	—	—	—	—	—	—	—
Salmonella	—	7	6	—	1	—	1	1	—	1
Shigella	—	—	—	—	—	—	—	—	2	—
Staphylococcus aureus	—	—	—	—	—	—	—	—	—	—
Total bacterial	—	7	6	—	1	8	2	2	2	4
Chemical										
Ciguatoxin	—	—	—	—	—	—	—	—	—	—
Heavy metal	—	—	—	—	—	—	—	—	—	—
Mushroom poisoning	—	—	—	—	—	—	—	—	—	—
Paralytic shellfish	—	—	—	—	—	—	—	—	—	—
Scombrotoxin	—	—	—	—	—	—	—	—	—	—
Other chemical	—	—	—	—	1	1	—	—	—	—
Total chemical	—	—	—	—	1	1	—	—	—	—
Parasitic										
Trichinella spiralis	—	—	—	—	—	—	—	—	—	—
Viral										
Hepatitis A	—	—	—	—	—	2	—	—	1	—
Confirmed etiology	—	7	6	—	2	11	2	2	3	4
Unknown etiology	—	—	—	—	—	3	2	3	8	—
Total 1988	—	7	6	—	2	14	4	5	11	4

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 21. Number of reported foodborne-disease outbreaks, by etiology and vehicle of transmission—United States,* 1988, continued

Etiology	Vehicle of transmission					Total known vehicle	Total unknown vehicle	Total
	Mexican food	Carbonated drink	Non-dairy beverage	Multiple vehicles	Mushrooms			
Bacterial								
Bacillus cereus	—	—	—	—	—	5	—	5
Campylobacter	—	—	—	—	—	1	3	4
Clostridium botulinum	—	—	—	2	—	17	3	20
Escherichia coli	—	—	—	—	—	2	—	2
Salmonella	—	—	—	26	—	60	34	94
Shigella	—	—	—	1	—	3	3	6
Staphylococcus aureus	—	—	—	3	—	8	—	8
Total bacterial	—	—	—	32	—	96	43	139
Chemical								
Ciguatoxin	—	—	—	—	—	4	—	4
Heavy metals	—	—	2	—	—	2	—	2
Mushroom poisoning	—	—	—	—	2	2	—	2
Paralytic shellfish	—	—	—	—	—	1	—	1
Scombrotoxin	—	—	—	—	—	16	—	16
Other chemical	1	—	1	—	—	4	—	4
Total chemical	1	—	3	—	2	29	—	29
Parasitic								
Trichinella spiralis	—	—	—	—	—	2	1	3
Viral								
Hepatitis A	—	—	1	2	—	7	5	12
Confirmed etiology	1	—	4	34	2	134	49	183
Unknown etiology	1	—	3	32	—	72	196	268
Total 1988	2	—	7	66	2	206	245	451

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 22. Number of reported foodborne-disease outbreaks, by etiology and vehicle of transmission—United States,* 1989

Etiology	Vehicle of transmission									
	Beef	Ham	Pork	Sausage	Chicken	Turkey	Other meats and stews	Shellfish	Other fish	Milk
Bacterial										
Bacillus cereus	—	—	—	—	1	—	—	—	—	—
Campylobacter	1	—	—	—	—	—	—	—	—	1
Clostridium botulinum	—	—	—	—	—	—	2	—	1	—
Clostridium perfringens	2	—	—	—	—	—	—	—	—	—
Escherichia coli	—	—	—	—	—	—	—	—	—	—
Listeria monocytogenes	—	—	—	—	—	—	—	—	—	—
Salmonella	1	1	—	—	1	3	—	1	—	—
Shigella	—	—	—	—	—	—	—	—	—	—
Staphylococcus aureus	—	3	—	—	—	—	—	—	1	—
Streptococcus Group A	—	—	—	—	—	—	—	—	—	—
Total bacterial	**4**	**4**	**—**	**—**	**2**	**3**	**2**	**1**	**2**	**1**
Chemical										
Ciguatoxin	—	—	—	—	—	—	1	—	18	—
Heavy metals	—	—	—	—	—	—	—	—	—	—
Scombrotoxin	—	—	—	—	—	—	—	—	17	—
Total chemical	**—**	**—**	**—**	**—**	**—**	**—**	**1**	**—**	**35**	**—**
Parasitic										
Giardia lamblia	—	—	—	—	—	—	—	—	—	—
Trichinella spiralis	—	—	—	1	—	—	3	—	—	—
Total parasitic	**—**	**—**	**—**	**1**	**—**	**—**	**3**	**—**	**—**	**—**
Viral										
Hepatitis A	—	—	—	—	—	—	1	—	—	—
Norwalk	—	—	—	—	—	—	—	—	—	—
Total viral	**—**	**—**	**—**	**—**	**—**	**—**	**1**	**—**	**—**	**—**
Confirmed etiology	4	4	—	1	2	3	7	1	37	1
Unknown etiology	8	2	—	1	7	3	1	7	2	2
Total 1988	**12**	**6**	**—**	**2**	**9**	**6**	**8**	**8**	**39**	**3**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 22. Number of reported foodborne-disease outbreaks, by etiology and vehicle of transmission—United States,* 1989, continued

Etiology	Vehicle of transmission									
	Cheese	Eggs	Ice cream	Other/ multiple dairy	Baked foods	Fruits and vegetables	Potato salad	Poultry, fish, egg salad	Other salad	Chinese food
Bacterial										
Bacillus cereus	—	—	—	—	—	—	—	—	—	2
Campylobacter	—	—	—	—	—	1	—	—	—	—
Clostridium botulinum	—	—	—	—	—	7	—	—	—	—
Clostridium perfringens	—	—	—	—	—	—	—	—	—	—
Escherichia coli	—	—	—	—	—	—	—	—	—	—
Listeria monocytogenes	—	—	—	—	—	—	—	—	—	—
Salmonella	1	3	1	—	3	3	1	1	5	1
Shigella	—	—	—	—	—	—	1	—	2	—
Staphylococcus aureus	—	—	—	—	—	—	—	—	—	1
Streptococcus Group A	—	—	—	—	—	—	—	—	—	—
Total bacterial	1	3	1	—	3	11	2	1	7	4
Chemical										
Ciguatoxin	—	—	—	—	—	—	—	—	—	—
Heavy metal	—	—	—	—	—	—	—	—	—	—
Scombrotoxin	—	—	—	—	—	—	—	—	—	—
Total chemical	—	—	—	—	—	—	—	—	—	—
Parasitic										
Giardia lamblia	—	—	—	—	—	—	—	—	—	—
Trichinella spiralis	—	—	—	—	—	—	—	—	—	—
Total parasitic	—	—	—	—	—	—	—	—	—	—
Viral										
Hepatitis A	—	—	—	—	—	—	—	—	—	—
Norwalk	—	—	—	—	—	—	—	—	—	—
Total viral	—	—	—	—	—	—	—	—	—	—
Confirmed etiology	1	3	1	—	3	11	2	1	7	4
Unknown etiology	—	—	—	1	—	10	1	2	10	2
Total 1989	1	3	1	1	3	21	3	3	17	6

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 22. Number of reported foodborne-disease outbreaks, by etiology and vehicle of transmission—United States,* 1989, continued

Etiology	Vehicle of transmission					Total known vehicle	Total unknown vehicle	Total
	Mexican food	Carbonated drink	Non-dairy beverage	Multiple vehicles	Mushrooms			
Bacterial								
Bacillus cereus	—	—	—	—	—	3	—	3
Campylobacter	—	—	—	2	—	5	3	8
Clostridium botulinum	—	—	—	1	—	11	2	13
Clostridium perfringens	3	—	—	1	—	6	1	7
Escherichia coli	—	—	—	—	—	—	1	1
Listeria monocytogenes	—	—	—	—	—	—	1	1
Salmonella	—	—	1	29	—	56	61	117
Shigella	—	—	—	1	—	4	2	6
Staphylococcus aureus	1	—	—	7	1	14	—	14
Streptococcus Group A	—	—	—	—	—	—	1	1
Total bacterial	**4**	**—**	**1**	**41**	**1**	**99**	**72**	**171**
Chemical								
Ciguatoxin	—	—	—	—	—	19	—	19
Heavy metals	—	—	—	1	—	1	—	1
Scombrotoxin	—	—	—	1	—	17	—	17
Total chemical	**—**	**—**	**1**	**—**	**—**	**37**	**—**	**37**
Parasitic								
Giardia lamblia	—	—	—	1	—	1	—	1
Trichinella spiralis	—	—	—	—	—	4	—	4
Total parasitic	**—**	**—**	**—**	**1**	**—**	**5**	**—**	**5**
Viral								
Hepatitis A	1	—	—	—	—	2	5	7
Norwalk	—	—	—	—	—	—	1	1
Total viral	**1**	**—**	**—**	**—**	**—**	**2**	**6**	**8**
Confirmed etiology	5	—	1	43	1	143	78	221
Unknown etiology	2	—	1	32	—	94	190	284
Total 1989	**7**	**—**	**2**	**75**	**1**	**237**	**268**	**505**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 23. Number of reported foodborne-disease outbreaks, by etiology and vehicle of transmission—United States,* 1990

Etiology	Vehicle of transmission									
	Beef	Ham	Pork	Sausage	Chicken	Turkey	Other meats and stews	Shellfish	Other fish	Milk
Bacterial										
Bacillus cereus	—	—	—	—	—	—	—	—	—	—
Campylobacter	—	—	—	—	—	—	—	—	—	1
Clostridium botulinum	—	—	—	1	—	—	—	—	3	—
Clostridium perfringens	2	—	—	—	1	1	—	—	—	—
Escherichia coli	1	—	—	—	—	—	—	—	—	—
Salmonella	2	—	—	—	3	3	2	2	1	—
Shigella	—	—	—	—	—	—	—	1	1	—
Staphylococcus aureus	2	3	1	—	1	—	—	—	—	—
Vibrio cholerae	—	—	—	—	—	—	—	—	—	—
Vibrio parahemolyticus	—	—	—	—	—	—	—	4	—	—
Vibrio vulnificus	—	—	—	—	—	—	—	1	—	—
Total bacterial	7	3	1	1	5	4	2	8	5	1
Chemical										
Ciguatoxin	—	—	—	—	—	—	—	—	11	—
Mushroom poisoning	—	—	—	—	—	—	—	—	—	—
Paralytic shellfish	—	—	—	—	—	—	—	2	—	—
Scombrotoxin	—	—	—	—	—	—	—	—	11	—
Other chemical	—	—	—	—	—	—	—	—	—	—
Total chemical	—	—	—	—	—	—	—	2	22	—
Parasitic										
Giardia lamblia	—	—	—	—	—	—	—	—	—	—
Trichinella spiralis	—	—	2	—	—	—	—	—	—	—
Total parasitic	—	—	2	—	—	—	—	—	—	—
Viral										
Hepatitis A	—	—	—	—	—	—	—	—	—	—
Confirmed etiology	7	3	3	1	5	4	2	10	27	1
Unknown etiology	6	1	—	—	2	2	—	1	4	2
Total 1990	13	4	3	1	7	6	2	11	31	3

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 23. Number of reported foodborne-disease outbreaks, by etiology and vehicle of transmission—United States,* 1990, continued

Etiology	Vehicle of transmission									
	Cheese	Eggs	Ice cream	Other/ multiple dairy	Baked foods	Fruits and vegetables	Potato salad	Poultry, fish, egg salad	Other salad	Chinese food
Bacterial										
Bacillus cereus	—	—	—	—	1	—	—	—	—	4
Campylobacter	—	—	—	—	—	—	—	—	—	—
Clostridium botulinum	—	—	—	—	—	4	—	—	—	—
Clostridium perfringens	—	—	—	—	—	—	—	—	—	—
Escherichia coli	—	—	—	—	—	—	—	—	—	—
Salmonella	2	5	4	—	1	3	—	2	4	—
Shigella	—	—	—	—	—	—	—	1	—	—
Staphylococcus aureus	—	—	—	—	1	—	—	—	1	1
Vibrio cholerae	—	—	—	—	—	—	—	—	—	—
Vibrio parahemolyticus	—	—	—	—	—	—	—	—	—	—
Vibrio vulnificus	—	—	—	—	—	—	—	—	—	—
Total bacterial	**2**	**5**	**4**	**—**	**3**	**7**	**—**	**3**	**5**	**5**
Chemical										
Ciguatoxin	—	—	—	—	—	—	—	—	—	—
Mushroom poisoning	—	—	—	—	—	—	—	—	—	—
Paralytic shellfish	—	—	—	—	—	—	—	—	—	—
Scombrotoxin	—	—	—	—	—	—	—	—	—	—
Other chemical	—	—	1	—	—	—	—	—	—	—
Total chemical	**—**	**—**	**1**	**—**	**—**	**—**	**—**	**—**	**—**	**—**
Parasitic										
Giardia lamblia	—	—	—	—	—	1	—	—	1	—
Trichinella spiralis	—	—	—	—	—	—	—	—	—	—
Total parasitic	**—**	**—**	**—**	**—**	**—**	**1**	**—**	**—**	**1**	**—**
Viral										
Hepatitis A	1	—	—	—	—	2	—	—	—	—
Confirmed etiology	3	5	5	—	3	10	—	3	6	5
Unknown etiology	—	—	1	1	4	5	1	3	14	—
Total 1990	**3**	**5**	**6**	**1**	**7**	**15**	**1**	**6**	**20**	**5**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 23. Number of reported foodborne-disease outbreaks, by etiology and vehicle of transmission—United States,* 1990, continued

Etiology	Vehicle of transmission					Total known vehicle	Total unknown vehicle	Total
	Mexican food	Carbonated drink	Non-dairy beverage	Multiple vehicles	Mushrooms			
Bacterial								
Bacillus cereus	—	—	—	—	—	5	—	5
Campylobacter	—	—	—	—	—	1	2	3
Clostridium botulinum	—	—	—	—	—	8	4	12
Clostridium perfringens	2	—	—	4	—	10	1	11
Escherichia coli	—	—	—	—	—	1	1	2
Salmonella	2	—	—	28	—	64	72	136
Shigella	—	—	—	—	—	3	5	8
Staphylococcus aureus	1	—	—	1	—	12	1	13
Vibrio cholerae	—	—	—	1	—	1	—	1
Vibrio parahemolyticus	—	—	—	—	—	4	—	4
Vibrio vulnificus	—	—	—	—	—	1	—	1
Total bacterial	**5**	**—**	**—**	**34**	**—**	**110**	**86**	**196**
Chemical								
Ciguatoxin	—	—	—	—	—	11	—	11
Mushroom poisoning	—	—	—	—	1	1	—	1
Paralytic shellfish	—	—	—	—	—	2	—	2
Scombrotoxin	—	—	—	—	—	11	—	11
Other chemical	—	1	—	—	—	2	—	2
Total chemical	**—**	**1**	**—**	**—**	**1**	**27**	**—**	**27**
Parasitic								
Giardia lamblia	—	—	—	—	—	2	1	3
Trichinella spiralis	—	—	—	—	—	2	—	2
Total parasitic	**—**	**—**	**—**	**—**	**—**	**4**	**1**	**5**
Viral								
Hepatitis A	—	—	—	3	—	6	3	9
Confirmed etiology	5	1	—	37	1	147	90	237
Unknown etiology	5	1	—	42	—	95	200	295
Total 1990	**10**	**2**	**—**	**79**	**1**	**242**	**290**	**532**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 24. Number of reported foodborne-disease outbreaks, by etiology and vehicle of transmission—United States,* 1991

Etiology	Vehicle of transmission									
	Beef	Ham	Pork	Sausage	Chicken	Turkey	Other meats and stews	Shellfish	Other fish	Milk
Bacterial										
Bacillus cereus	—	—	1	—	—	—	—	—	—	—
Campylobacter	—	—	—	—	—	—	1	—	—	—
Clostridium botulinum	—	—	—	—	—	—	3	—	3	—
Clostridium perfringens	1	1	—	—	—	2	1	—	—	—
Escherichia coli	—	—	—	—	—	—	—	—	—	—
Salmonella	1	—	1	—	6	—	—	1	1	1
Shigella	—	—	—	—	—	—	1	1	—	—
Staphylococcus aureus	—	—	—	—	—	—	—	—	—	—
Streptococcus Group A	—	—	—	—	—	—	—	—	—	—
Vibrio cholerae	—	—	—	—	—	—	—	1	—	—
Total bacterial	**2**	**1**	**2**	**—**	**6**	**2**	**6**	**3**	**4**	**1**
Chemical										
Ciguatoxin	—	—	—	—	—	—	—	—	7	—
Mushroom poisoning	—	—	—	—	—	—	—	—	—	—
Paralytic shellfish	—	—	—	—	—	—	—	2	—	—
Scombrotoxin	—	—	—	—	—	—	1	—	16	—
Other chemical	—	—	—	—	—	—	—	—	—	—
Total chemical	**—**	**—**	**—**	**—**	**—**	**—**	**1**	**2**	**23**	**—**
Parasitic										
Giardia lamblia	—	—	—	—	—	—	—	—	—	—
Trichinella spiralis	—	—	—	1	—	—	—	—	—	—
Total parasitic	**—**	**—**	**—**	**1**	**—**	**—**	**—**	**—**	**—**	**—**
Viral										
Hepatitis A	—	—	—	—	—	—	—	—	—	—
Confirmed etiology	2	1	2	1	6	2	7	5	27	1
Unknown etiology	11	1	1	—	4	7	2	2	2	—
Total 1991	**13**	**2**	**3**	**1**	**10**	**9**	**9**	**7**	**29**	**1**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 24. Number of reported foodborne-disease outbreaks, by etiology and vehicle of transmission—United States,* 1991, continued

Etiology	Vehicle of transmission									
	Cheese	Eggs	Ice cream	Other/ multiple dairy	Baked foods	Fruits and vegetables	Potato salad	Poultry, fish, egg salad	Other salad	Chinese food
Bacterial										
Bacillus cereus	—	—	—	—	—	—	—	—	—	2
Campylobacter	—	—	—	—	—	—	—	—	—	—
Clostridium botulinum	—	—	—	—	—	4	—	—	—	—
Clostridium perfringens	—	—	—	—	—	—	—	—	—	—
Escherichia coli	—	—	—	—	—	—	—	—	—	—
Salmonella	—	1	3	—	2	3	1	1	4	—
Shigella	—	—	—	—	—	—	—	—	—	—
Staphylococcus aureus	—	—	—	1	2	—	1	1	—	1
Streptococcus Group A	—	—	—	—	—	—	—	—	—	—
Vibrio cholerae	—	—	—	—	—	1	—	—	—	—
Total bacterial	—	1	3	1	4	8	2	2	4	3
Chemical										
Ciguatoxin	—	—	—	—	—	—	—	—	—	—
Mushroom poisoning	—	—	—	—	—	—	—	—	—	—
Paralytic shellfish	—	—	—	—	—	—	—	—	—	—
Scombrotoxin	—	—	—	—	—	—	—	—	—	—
Other chemical	—	—	1	—	—	—	—	—	—	—
Total chemical	—	—	1	—	—	—	—	—	—	—
Parasitic										
Giardia lamblia	—	—	—	—	—	1	—	—	—	—
Trichinella spiralis	—	—	—	—	—	—	—	—	—	—
Total parasitic	—	—	—	—	—	1	—	—	—	—
Viral										
Hepatitis A	—	—	—	—	1	—	—	—	1	—
Confirmed etiology	—	1	4	1	5	9	2	2	5	3
Unknown etiology	1	1	—	1	6	3	—	1	12	1
Total 1991	1	2	4	2	11	12	2	3	17	4

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 24. Number of reported foodborne-disease outbreaks, by etiology and vehicle of transmission—United States,* 1991, continued

Etiology	Vehicle of transmission					Total known vehicle	Total unknown vehicle	Total
	Mexican food	Carbonated drink	Non-dairy beverage	Multiple vehicles	Mushrooms			
Bacterial								
Bacillus cereus	—	—	—	2	—	5	—	5
Campylobacter	—	—	—	1	—	2	4	6
Clostridium botulinum	—	—	—	—	—	10	1	11
Clostridium perfringens	1	—	—	3	—	9	1	10
Escherichia coli	—	—	1	1	—	2	1	3
Salmonella	1	—	—	30	—	57	65	122
Shigella	—	—	—	—	—	2	2	4
Staphylococcus aureus	1	—	—	2	—	9	—	9
Streptococcus Group A	—	—	—	1	—	1	—	1
Vibrio cholerae	—	—	—	—	—	2	—	2
Total bacterial	**3**	**—**	**1**	**40**	**—**	**99**	**74**	**173**
Chemical								
Ciguatoxin	—	—	—	—	—	7	—	7
Mushroom poisoning	—	—	—	—	2	2	—	2
Paralytic shellfish	—	—	—	—	—	2	—	2
Scombrotoxin	—	—	—	—	—	17	—	17
Other chemical	—	1	1	—	—	3	—	3
Total chemical	**—**	**1**	**1**	**—**	**2**	**31**	**—**	**31**
Parasitic								
Giardia lamblia	—	—	—	—	—	1	1	2
Trichinella spiralis	—	—	—	—	—	1	—	1
Total parasitic	**—**	**—**	**—**	**—**	**—**	**2**	**1**	**3**
Viral								
Hepatitis A	—	—	—	—	—	2	5	7
Confirmed etiology	3	1	2	40	2	134	80	214
Unknown etiology	4	—	1	40	—	101	213	314
Total 1991	**7**	**1**	**3**	**80**	**2**	**235**	**293**	**528**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 25. Number of reported foodborne-disease outbreaks, by etiology and vehicle of transmission—United States,* 1992

Etiology	Vehicle of transmission									
	Beef	Ham	Pork	Sausage	Chicken	Turkey	Other meats and stews	Shellfish	Other fish	Milk
Bacterial										
Bacillus cereus	—	—	—	—	1	—	—	—	—	—
Campylobacter	—	—	—	—	—	—	—	—	—	2
Campylobacter/Salmonella	—	—	—	—	1	—	—	—	—	—
Clostridium botulinum	—	—	—	—	—	—	—	—	2	—
Clostridium perfringens	2	—	—	—	1	1	1	—	—	—
Escherichia coli	—	—	—	—	—	—	—	—	—	1
Salmonella	—	—	—	—	—	—	—	—	—	—
Shigella	—	—	—	—	—	—	—	—	—	—
Staphylococcus aureus	2	1	—	—	—	—	—	—	—	—
Vibrio cholerae	—	—	—	—	—	—	—	—	—	—
Total bacterial	**4**	**1**	**—**	**—**	**3**	**1**	**1**	**—**	**2**	**3**
Chemical										
Ciguatoxin	—	—	—	—	—	—	—	—	1	—
Scombrotoxin	—	—	—	—	—	—	—	—	14	—
Other chemical	—	—	—	—	—	—	—	—	1	—
Total chemical	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**16**	**—**
Parasitic										
Giardia lamblia	—	—	—	—	—	—	—	—	—	—
Viral										
Hepatitis A	—	—	—	—	—	—	—	—	—	—
Norwalk-like virus	—	—	—	—	—	—	—	—	—	—
Total viral	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**
Confirmed etiology	4	1	—	—	3	1	1	—	18	3
Unknown etiology	5	1	—	—	4	2	2	5	2	—
Total 1992	**9**	**2**	**—**	**—**	**7**	**3**	**3**	**5**	**20**	**3**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 25. Number of reported foodborne-disease outbreaks, by etiology and vehicle of transmission—United States,* 1992, continued

Etiology	Vehicle of transmission									
	Cheese	Eggs	Ice cream	Other/ multiple dairy	Baked foods	Fruits and vegetables	Potato salad	Poultry, fish, egg salad	Other salad	Chinese food
Bacterial										
Bacillus cereus	—	—	—	—	—	—	—	—	—	1
Campylobacter	—	—	—	—	—	—	—	—	—	—
Campylobacter/Salmonella	—	—	—	—	—	—	—	—	—	—
Clostridium botulinum	—	—	—	—	—	—	1	—	—	—
Clostridium perfringens	—	—	—	—	—	—	—	1	—	—
Escherichia coli	—	—	—	—	—	—	—	—	—	—
Salmonella	—	3	2	1	3	—	1	2	3	—
Shigella	—	—	—	—	—	—	—	—	—	—
Staphylococcus aureus	—	—	—	—	—	—	—	—	—	—
Vibrio cholerae	—	—	—	—	—	—	—	—	—	—
Total bacterial	—	3	2	1	3	—	2	3	3	1
Chemical										
Ciguatoxin	—	—	—	—	—	—	—	—	—	—
Scombrotoxin	—	—	—	—	—	—	—	—	—	—
Other chemical	—	—	—	—	—	—	—	—	—	—
Total chemical	—	—	—	—	—	—	—	—	—	—
Parasitic										
Giardia lamblia	—	—	—	—	—	—	—	—	—	—
Viral										
Hepatitis A	—	—	—	—	—	—	—	—	—	—
Norwalk-like virus	—	—	—	—	—	—	—	—	—	—
Total viral	—	—	—	—	—	—	—	—	—	—
Confirmed etiology	—	3	2	1	3	—	2	3	3	1
Unknown etiology	—	—	1	—	3	2	1	2	8	1
Total 1992	—	3	3	1	6	2	3	5	11	2

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 25. Number of reported foodborne-disease outbreaks, by etiology and vehicle of transmission—United States,* 1992, continued

Etiology	Vehicle of transmission					Total known vehicle	Total unknown vehicle	Total
	Mexican food	Carbonated drink	Non-dairy beverage	Multiple vehicles	Mushrooms			
Bacterial								
Bacillus cereus	—	—	—	1	—	3	—	3
Campylobacter	—	—	—	1	—	3	3	6
Campylobacter/Salmonella	—	—	—	—	—	1	—	1
Clostridium botulinum	—	—	—	—	—	3	1	4
Clostridium perfringens	2	—	—	1	—	9	3	12
Escherichia coli	—	—	—	—	—	1	2	3
Salmonella	1	—	—	19	—	35	45	80
Shigella	—	—	—	—	—	—	1	1
Staphylococcus aureus	—	—	—	3	—	6	—	6
Vibrio cholerae	—	—	—	—	—	—	1	1
Total bacterial	**3**	**—**	**—**	**25**	**—**	**61**	**56**	**117**
Chemical								
Ciguatoxin	—	—	—	—	—	1	—	1
Scombrotoxin	—	—	—	—	—	14	1	15
Other chemical	—	—	—	2	—	3	—	3
Total chemical	**—**	**—**	**—**	**2**	**—**	**18**	**1**	**19**
Parasitic								
Giardia lamblia	—	—	—	—	—	—	1	1
Total parasitic	**—**	**—**	**—**	**—**	**—**	—	1	1
Viral								
Hepatitis A	—	—	—	1	—	1	7	8
Norwalk-like virus	—	—	—	1	—	1	—	1
Total viral	**—**	**—**	**—**	**2**	**—**	**2**	**7**	**9**
Confirmed etiology	3	—	—	29	—	81	65	146
Unknown etiology	5	—	1	25	—	70	191	261
Total 1992	**8**	**—**	**1**	**54**	**—**	**151**	**256**	**407**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 26. Number of reported foodborne-disease outbreaks, by etiology and contributing factors—United States,* 1988

Etiology	No. of reported outbreaks	No. of outbreaks in which factors reported	Contributing factors					
			Improper holding temperatures	Inadequate cooking	Contaminated equipment	Food from unsafe source	Poor personal hygiene	Other
Bacterial								
Bacillus cereus	5	4	4	1	—	—	—	—
Campylobacter	4	2	—	2	—	—	1	—
Clostridium botulinum	20	2	—	—	—	2	—	—
Escherichia coli	2	2	1	2	—	2	—	—
Salmonella	94	73	40	35	15	9	37	12
Shigella	6	5	3	—	1	—	4	—
Staphylococcus aureus	8	7	6	1	1	—	5	2
Total bacterial	**139**	**95**	**54**	**41**	**17**	**13**	**47**	**14**
Chemical								
Ciguatoxin	4	1	—	—	—	—	—	1
Heavy metals	2	2	1	—	—	—	1	2
Mushroom poisoning	2	2	—	—	—	2	—	—
Paralytic shellfish	1	1	—	—	—	1	—	—
Scombrotoxin	16	8	8	—	—	2	—	—
Other chemical	4	4	1	—	1	2	—	1
Total chemical	**29**	**18**	**10**	**—**	**1**	**7**	**1**	**4**
Parasitic								
Trichinella spiralis	3	2	—	—	—	2	—	—
Viral								
Hepatitis A	12	11	1	—	—	3	8	2
Confirmed etiology	183	126	65	41	18	25	56	20
Unknown etiology	268	145	94	29	18	4	62	30
Total 1988	**451**	**271**	**159**	**70**	**36**	**29**	**118**	**50**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 27. Number of reported foodborne-disease outbreaks, by etiology and contributing factors—United States,* 1989

Etiology	No. of reported outbreaks	No. of outbreaks in which factors reported	Contributing factors					
			Improper holding temperatures	Inadequate cooking	Contaminated equipment	Food from unsafe source	Poor personal hygiene	Other
Bacterial								
Bacillus cereus	3	1	1	1	—	—	—	—
Campylobacter	8	7	3	4	5	1	3	—
Clostridium botulinum	13	8	4	6	—	—	—	
Clostridium perfringens	7	5	5	1	—	—	—	1
Escherichia coli	1	—	—	—	—	—	—	—
Listeria monocytogenes	1	—	—	—	—	—	—	—
Salmonella	117	72	39	36	21	11	26	7
Shigella	6	4	2	—	1	—	4	—
Staphylococcus aureus	14	13	11	4	—	2	7	2
Streptococcus Group A	1	1	—	—	—	—	—	1
Total bacterial	**171**	**111**	**65**	**52**	**27**	**14**	**40**	**11**
Chemical								
Ciguatoxin	19	8	—	—	—	6	—	2
Heavy metals	1	1	—	—	—	1	—	
Scombrotoxin	17	10	7	1	—	1	—	1
Total chemical	**37**	**19**	**7**	**1**	**—**	**8**	**—**	**3**
Parasitic								
Giardia lamblia	1	—	—	—	—	—	—	—
Trichinella spiralis	4	—	—	—	—	—	—	—
Total parasitic	**5**	**—**	**—**	**—**	**—**	**—**	**—**	**—**
Viral								
Hepatitis A	7	4	—	—	—	—	4	—
Norwalk	1	1	—	—	—	—	1	—
Total viral	**8**	**5**	**—**	**—**	**—**	**—**	**5**	**—**
Confirmed etiology	221	135	72	53	27	22	45	14
Unknown etiology	284	136	82	27	22	13	56	24
Total 1989	**505**	**271**	**154**	**80**	**49**	**35**	**101**	**38**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 28. Number of reported foodborne-disease outbreaks, by etiology and contributing factors—United States,* 1990

Etiology	No. of reported outbreaks	No. of outbreaks in which factors reported	Contributing factors					
			Improper holding temperatures	Inadequate cooking	Contaminated equipment	Food from unsafe source	Poor personal hygiene	Other
Bacterial								
Bacillus cereus	5	4	4	1	1	—	1	—
Campylobacter	3	3	1	—	—	1	—	1
Clostridium botulinum	12	6	3	4	—	—	—	1
Clostridium perfringens	11	11	9	6	2	—	—	1
Escherichia coli	2	2	1	2	1	—	—	—
Salmonella	136	86	51	49	21	13	34	3
Shigella	8	4	1	—	1	—	4	—
Staphylococcus aureus	13	9	9	4	1	2	4	—
Vibrio cholerae	1	1	1	1	—	1	1	—
Vibrio parahemolyticus	4	3	—	3	—	2	—	—
Vibrio vulnificus	1	—	—	—	—	—	—	—
Total bacterial	**196**	**129**	**80**	**70**	**27**	**19**	**44**	**6**
Chemical								
Ciguatoxin	11	5	1	—	—	3	—	1
Mushroom poisoning	1	—	—	—	—	—	—	—
Paralytic shellfish	2	2	—	—	—	2	—	—
Scombrotoxin	11	7	7	—	1	1	—	—
Other chemical	2	2	—	—	—	—	—	2
Total chemical	**27**	**16**	**8**	**—**	**1**	**6**	**—**	**3**
Parasitic								
Giardia lamblia	3	2	—	—	—	—	2	—
Trichinella spiralis	2	2	—	2	—	—	—	—
Total parasitic	**5**	**4**	**—**	**2**	**—**	**—**	**2**	**—**
Viral								
Hepatitis A	9	9	—	—	—	1	8	—
Confirmed etiology	237	158	88	72	28	26	54	9
Unknown etiology	295	160	89	20	22	16	61	14
Total 1990	**532**	**318**	**177**	**92**	**50**	**42**	**115**	**23**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 29. Number of reported foodborne-disease outbreaks, by etiology and contributing factors—United States,* 1991

Etiology	No. of reported outbreaks	No. of outbreaks in which factors reported	Contributing factors					
			Improper holding temperatures	Inadequate cooking	Contaminated equipment	Food from unsafe source	Poor personal hygiene	Other
Bacterial								
Bacillus cereus	5	4	4	—	—	1	—	1
Campylobacter	6	5	2	1	4	—	—	1
Clostridium botulinum	11	2	—	2	—	—	—	—
Clostridium perfringens	10	9	9	2	—	—	1	—
Escherichia coli	3	3	2	2	—	—	—	1
Salmonella	122	84	52	40	23	15	31	1
Shigella	4	3	1	1	—	—	1	—
Staphylococcus aureus	9	8	7	2	—	—	1	—
Streptococcus Group A	1	1	1	1	—	—	1	—
Vibrio cholerae	2	1	1	1	—	—	—	—
Total bacterial	**173**	**120**	**79**	**52**	**27**	**16**	**35**	**4**
Chemical								
Ciguatoxin	7	4	—	—	—	1	—	3
Mushroom poisoning	2	2	—	—	—	2	—	—
Paralytic shellfish	2	2	—	—	—	2	—	—
Scombrotoxin	17	14	13	—	—	5	—	1
Other chemical	3	2	—	—	1	—	—	1
Total chemical	**31**	**24**	**13**	**—**	**1**	**10**	**—**	**5**
Parasitic								
Giardia lamblia	2	2	1	—	1	—	1	—
Trichinella spiralis	1	1	—	1	—	—	—	—
Total parasitic	**3**	**3**	**1**	**1**	**1**	**—**	**1**	**—**
Viral								
Hepatitis A	7	5	1	—	—	—	5	—
Confirmed etiology	214	152	94	53	29	26	41	9
Unknown etiology	315	183	115	36	21	12	69	12
Total 1991	**529**	**335**	**209**	**89**	**50**	**38**	**110**	**21**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

TABLE 30. Number of reported foodborne-disease outbreaks, by etiology and contributing factors—United States,* 1992

Etiology	No. of reported outbreaks	No. of outbreaks in which factors reported	Contributing factors					
			Improper holding temperatures	Inadequate cooking	Contaminated equipment	Food from unsafe source	Poor personal hygiene	Other
Bacterial								
Bacillus cereus	3	3	3	1	1	—	1	—
Campylobacter	6	4	1	—	2	2	—	1
Campylobacter/Salmonella	1	1	1	—	1	—	—	—
Clostridium botulinum	4	1	—	1	—	—	—	—
Clostridium perfringens	12	8	8	4	1	—	—	197
Escherichia coli	3	2	1	1	1	—	—	—
Salmonella	80	57	33	31	12	4	15	3
Shigella	1	0	—	—	—	—	—	—
Staphylococcus aureus	6	5	4	4	2	—	1	—
Vibrio cholerae	1	1	—	—	—	1	—	—
Total bacterial	**117**	**82**	**51**	**42**	**20**	**7**	**17**	**4**
Chemical								
Ciguatoxin	1	0	—	—	—	—	—	—
Scombrotoxin	15	12	10	1	—	2	—	2
Other chemical	3	3	—	—	—	1	—	2
Total chemical	**19**	**15**	**10**	**1**	**—**	**3**	**—**	**4**
Parasitic								
Giardia lamblia	1	0	—	—	—	—	—	—
Viral								
Hepatitis A	8	8	—	—	—	—	7	1
Norwalk-like virus	1	1	—	—	—	—	1	—
Total viral	**9**	**9**	**—**	**—**	**—**	**—**	**8**	**1**
Confirmed etiology	146	106	61	43	20	10	25	9
Unknown etiology	261	134	88	27	24	7	45	14
Total 1992	**407**	**240**	**149**	**70**	**44**	**17**	**70**	**23**

*Includes Guam, Puerto Rico, and the U.S. Virgin Islands.

Appendix A

CDC Form 52.13, Investigation of a Foodborne Outbreak*

DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

CDC USE ONLY ☐☐☐☐ (1-4)

FORM APPROVED
OMB NO. 0920-0004

INVESTIGATION OF A FOODBORNE OUTBREAK

1. Where did the outbreak occur ?
State _____ (5-6) City or Town _____ County _____

2. Date of outbreak: (Date of onset 1st case)
MO / DA / YR (7-12)

3. Indicate actual(a) or estimated (e) numbers:
Persons exposed _____ (13-17)
Persons ill _____ (18-22)
Hospitalized _____ (23-27)
Fatal case _____ (28-31)

4. History of Exposed Persons:
No. histories obtained _____ (32-35)
No. persons with symptoms _____ (36-39)
Nausea _____ (40-43) Diarrhea _____ (44-47)
Vomiting _____ (48-51) Fever _____ (52-55)
Cramps _____ (56-59) Other, specify _____ (60-79)

5. Incubation period (hours):
Shortest _____ (80-83) Longest _____ (84-87)
Approx. for majority _____ (88-91)

6. Duration of illness (hours):
Shortest _____ (92-95) Longest _____ (96-99)
Approx. for majority _____ (101-104)

7. Food - specific attack rates:

Food Items Served	Number of persons who ATE specified food				Number who did NOT eat specified food			
	III	Not III	Total	Percent III	III	Not III	Total	Percent III

8. Vehicle responsible (food item incriminated by epidemiological evidence): (105-106) _____

9. Manner in which incriminated food was marketed: (Check all Applicable)

	Yes 1	No 2		Yes 1	No 2	
(a) Food Industry			(c) Not Wrapped	☐	☐	(112)
Raw	☐	☐	(107)	Ordinary Wrapping	☐	☐	(113)
Processed	☐	☐	(108)	Canned	☐	☐	(114)
Home Produced				Canned—Vacuum Sealed	☐	☐	(115)
Raw	☐	☐	(109)	Other (specify) _____	☐	☐	(116)
Processed	☐	☐	(110)				(117-129)
(b) Vending Machine	☐	☐	(111)	(d) Room Temperature	☐	☐	(130)
				Refrigerator	☐	☐	(131)
				Frozen	☐	☐	(132)
				Heated	☐	☐	(133)

If a commercial product, indicate brand name and lot number
_____ (134-150)

10. Place of Preparation of Contaminated Item: (151)

Restaurant	☐	1
Delicatessen	☐	2
Cafeteria	☐	3
Private Home	☐	4
Caterer	☐	5
Institution:		
School	☐	6
Church	☐	7
Camp	☐	8
Other, specify _____	☐	9

(152-171)

11. Place where eaten: (172)

Restaurant	☐	1
Delicatessen	☐	2
Cafeteria	☐	3
Private Home	☐	4
Picnic	☐	5
Institution:		
School	☐	6
Church	☐	7
Camp	☐	8
Other, specify _____	☐	9

(173-192)

This report is authorized by law (Public Health Service Act, 42 USC 241). While your response is voluntary, your cooperation is necessary for the understanding and control of this public health problem. Public reporting burden for this collection of information is estimated to average 15 minutes per response. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to PHS Reports Clearance Officer; ATTN: PRA; Hubert H. Humphrey Bg, Rm 721-H; 200 Independence Ave., SW; Washington, DC 20201, and to the Office of Management and Budget; Paperwork Reduction Project (0920-0004); Washington, DC 20503.

CDC 52.13 REV. 9-89 (over)

*Additional forms may be obtained by contacting the Foodborne and Diarrheal Diseases Branch ([404] 639-2206).

LABORATORY FINDINGS (Include Negative Results)

12. Food specimens examined: (193)
Specify by "X" whether food examined was original lesion at time of outbreak) or check up (prepared in similar manner but not involved in outbreak).

Item	Orig.	Check up	Findings Qualitative	Findings Quantitative
Example: beef	X		C. perfringens Hobbs type 10	2 x 10^6/gm

13. Environmental specimens examined: (194)

Item	Findings
Example: meat grinder	C. perfringens, Hobbs Type 10

14. Specimens from patients examined (stool, vomitus, etc.): (195)

Item	No. Persons	Findings
Example: stool	11	C. perfringens, Hobbs Type 10

15. Specimens from food handlers (stool, lesions, etc.): (196)

Item	Findings
Example: lesion	C. perfringens, Hobbs Type 10

16. Factors contributing to outbreak (check all applicable):

	Yes 1	No 2	Unk.	
1. Improper storage or holding temperature	☐	☐	☐	(197)
2. Inadequate cooking	☐	☐	☐	(198)
3. Contaminated equipment or working surfaces	☐	☐	☐	(199)
4. Food obtained from unsafe source	☐	☐	☐	(200)
5. Poor personal hygiene of food handler	☐	☐	☐	(201)
6. Other, specify	☐	☐	☐	(202)

17. Etiology: (203-204)

Pathogen _____ Suspected ☐ 1 (205)
Chemical _____ Confirmed ☐ 2
Other _____ Unknown ☐ 3

18. Remarks: Briefly describe aspects of the investigation not covered above, such as unusual age or sex distribution; unusual circumstances leading to contamination of food, water, epidemic curve; etc. (Attach additional page if necessary)

(206-225)

Name of reporting agency: (226)

Investigating official: Date of Investigation:

NOTE: Epidemic and Laboratory Assistance for the investigation of a foodborne outbreak is available upon request by the State Health Department to the Centers for Disease control, Atlanta, Georgia 30333

To improve national surveillance, please send a copy of this report to: Enteric Diseases Branch
Bacterial Diseases Division
Center for Infectious Diseases
Centers for Disease Control
Atlanta, Georgia 30333

Submitted copies should include as much information as possible, but the completion of every item is not required.

CDC 52.13 (back)
REV. 1-89

Appendix B

Guidelines for Confirmation of Foodborne-Disease Outbreaks

A foodborne-disease outbreak (FBDO) is defined as an incident in which two or more persons experience a similar illness resulting from the ingestion of a common food. Before 1992, three exceptions existed to this definition: one case of botulism, chemical, or marine toxin poisoning constituted an FBDO if the etiology for that type of FBDO was confirmed. Since the beginning of 1992, two or more persons must become ill for the incident to be classified as an FBDO.

The following table provides information concerning incubation periods, clinical syndromes, and criteria for confirming the etiology once an FBDO has been identified. The information on incubation periods and clinical syndromes is provided as a guideline and should not be included in the confirmation criteria. These guidelines may not include all etiologic agents and diagnostic tests.

FBDOs should be reported to the Foodborne and Diarrheal Diseases Branch at CDC on form 52.13 (i.e., Investigation of a Foodborne Outbreak). Provision of other documents describing the outbreak investigation also is encouraged. For information regarding collection of laboratory specimens and for additional information on viral agents, refer to other CDC publications (i.e., "Recommendations for Collection of Laboratory Specimens Associated with Outbreaks of Gastroenteritis," *MMWR* 1990:39[No. RR-14] and "Viral Agents of Gastroenteritis: Public Health Importance and Outbreak Management," *MMWR* 1990;39[No. RR-5]).

Table B-1. Guidelines for confirmation of foodborne-disease outbreaks

Etiologic agent	Incubation period	Clinical syndrome	Confirmation
Bacterial			
1. *Bacillus cerus*			
a. Vomiting toxin	1–6 hrs	Vomiting, some patients with diarrhea; fever uncommon	Isolation of organism from stool of two or more ill persons and not from stool of controls OR Isolation of $\geq 10^5$ organisms/g from epidemiologically implicated food, provided specimen properly handled
b. Diarrheal toxin	6–24 hrs	Diarrhea, abdominal cramps, and vomiting in some patients; fever uncommon	Isolation of organism from stool of two or more ill persons and not from stool of controls OR Isolation of $\geq 10^5$ organisms/g from epidemiologically implicated food, provided specimen properly handled
2. *Brucella*	Several days to several mos, usually >30 days	Weakness, fever, headache, sweats, chills, arthralgia, weight loss, splenomegaly	Two or more ill persons and isolation of organism in culture of blood or bone marrow, greater than fourfold increase in standard agglutination titer (SAT) over several wks, or single SAT titer ≥1:160 in person who has compatible clinical symptoms and history of exposure
3. *Campylobacter*	2–10 days, usually 2–5 days	Diarrhea (often bloody), abdominal pain, fever	Isolation of organism from clinical specimens from two or more ill persons OR Isolation of organism from epidemiologically implicated food

Table B-1. Guidelines for confirmation of foodborne-disease outbreaks — continued

Etiologic agent	Incubation period	Clinical syndrome	Confirmation
4. *Clostridium botulinum*	2 hrs–8 days, usually 12–48 hrs	Illness of variable severity; common symptoms are diplopia, blurred vision, and bulbar weakness; paralysis, which is usually descending and bilateral, may progress rapidly	Detection of botulinal toxin in serum, stool, gastric contents, or implicated food OR Isolation of organism from stool or intestine
5. *Clostridium perfringens*	6–24 hrs	Diarrhea, abdominal cramps; vomiting and fever are uncommon	Isolation of $\geq 10^6$ organisms/g in stool of two or more ill persons, provided specimen properly handled OR Demonstration of enterotoxin in the stool of two or more ill persons OR Isolation of $\geq 10^5$ organisms/g from epidemiologically implicated food, provided specimen properly handled
6. *Escherichia coli*			
a. Enterohemorrhagic (*E. coli* O157:H7 and others)	1–10 days, usually 3–4 days	Diarrhea (often bloody), abdominal cramps (often severe), little or no fever	Isolation of *E. coli* O157:H7 or other Shiga-like toxin-producing *E. coli* from clinical specimen of two or more ill persons OR Isolation of *E. coli* O157 or other Shiga-like toxin-producing *E. coli* from epidemiologically implicated food
b. Enterotoxigenic (ETEC)	6–48 hrs	Diarrhea, abdominal cramps, nausea; vomiting and fever are less common	Isolation of organism of same serotype, which are demonstrated to produce heat-stable (ST) and/or heat-labile (LT) enterotoxin, from stool of two or more ill persons
c. Enteropathogenic (EPEC)	Variable	Diarrhea, fever, abdominal cramps	Isolation of same enteropathogenic serotype from stool of two or more ill persons

Table B-1. Guidelines for confirmation of foodborne-disease outbreaks — continued

Etiologic agent	Incubation period	Clinical syndrome	Confirmation
d. Enteroinvasive (EIEC)	Variable	Diarrhea (may be bloody), fever, abdominal cramps	Isolation of same enteroinvasive serotype from stool of two or more ill persons
7. *Listeria monocytogenes*			
a. Invasive disease	2–6 wks	Meningitis, neonatal sepsis, fever	Isolation of organism from normally sterile site
b. Diarrheal disease	Unknown	Diarrhea, abdominal cramps, fever	Isolation of organism of same serotype from stool of two or more ill persons exposed to food that is epidemiologically implicated or from which organism of same serotype has been isolated
8. Nontyphoidal *Salmonella*	6 hrs–10 days, usually 6–48 hrs	Diarrhea, often with fever and abdominal cramps	Isolation of organism of same serotype from clinical specimens from two or more ill persons OR Isolation of organism from epidemiologically implicated food
9. *Salmonella typhi*	3–60 days, usually 7–14 days	Fever, anorexia, malaise, headache, and myalgia; sometimes diarrhea or constipation	Isolation of organism from clinical specimens of two or more ill persons OR Isolation of organism from epidemiologically implicated food
10. *Shigella*	12 hrs–6 days, usually 2–4 days	Diarrhea (often bloody), frequently accompanied by fever and abdominal cramps	Isolation of organism of same serotype from clinical specimens from two or more ill persons OR Isolation of organism from epidemiologically implicated food

Table B-1. Guidelines for confirmation of foodborne-disease outbreaks — continued

Etiologic agent	Incubation period	Clinical syndrome	Confirmation
11. *Staphylococcus aureus*	30 min–8 hrs, usually 2–4 hrs	Vomiting, diarrhea	Isolation of organism of same phage type from stool or vomitus of two or more ill persons OR Detection of enterotoxin in epidemiologically implicated food OR Isolation of $\geq 10^5$ organisms/g from epidemiologically implicated food, provided specimen properly handled
12. *Streptococcus* Group A	1–4 days	Fever, pharyngitis, scarlet fever, upper respiratory infection	Isolation of organism of same M- or T-type from throats of two or more ill persons OR Isolation of organism of same M- or T-type from epidemiologically implicated food
13. *Vibrio cholerae* a. O1 or O139	1–5 days	Watery diarrhea, often accompanied by vomiting	Isolation of toxigenic organism from stool or vomitus of two or more ill persons OR Significant rise in vibriocidal, bacterial-agglutinating, or antitoxin antibodies in acute- and early convalescent-phase sera among persons not recently immunized OR Isolation of toxigenic organism from epidemiologically implicated food
b. non-O1 and non-O139	1–5 days	Watery diarrhea	Isolation of organism of same serotype from stool of two or more ill persons

Table B-1. Guidelines for confirmation of foodborne-disease outbreaks — continued

Etiologic agent	Incubation period	Clinical syndrome	Confirmation
14. *Vibrio parahaemolyticus*	4–30 hrs	Diarrhea	Isolation of Kanagawa-positive organism from stool of two or more ill persons OR Isolation of $\geq 10^5$ Kanagawa-positive organisms/g from epidemiologically implicated food, provided specimen properly handled
15. *Yersinia enterocolitica*	1–10 days, usually 4–6 days	Diarrhea, abdominal pain (often severe)	Isolation of organism from clinical specimen of two or more ill persons OR Isolation of pathogenic strain or organism from epidemiologically implicated food
Chemical			
1. Marine toxins			
a. Ciguatoxin	1–48 hrs, usually 2–8 hrs	Usually gastrointestinal symptoms followed by neurologic symptoms (including paresthesia of lips, tongue, throat, or extremities) and reversal of hot and cold sensation	Demonstration of ciguatoxin in epidemiologically implicated fish OR Clinical syndrome among persons who have eaten a type of fish previously associated with ciguatera fish poisoning (e.g., snapper, grouper, or barracuda)
b. Scombroid toxin (histamine)	1 min–3 hrs, usually <1 hr	Flushing, dizziness, burning of mouth and throat, headache, gastrointestinal symptoms, urticaria, and generalized pruritus	Demonstration of histamine in epidemiologically implicated food OR Clinical syndrome among persons who have eaten type of fish previously associated with histamine fish poisoning (e.g., mahi-mahi or fish of order Scomboidei)

Table B-1. Guidelines for confirmation of foodborne-disease outbreaks — continued

Etiologic agent	Incubation period	Clinical syndrome	Confirmation
c. Paralytic or neurotoxic shellfish poison	30 min–3 hrs	Paresthesia of lips, mouth or face, and extremities; intestinal symptoms or weakness, including respiratory difficulty	Detection of toxin in epidemiologically implicated food OR Detection of large numbers of shellfish-poisoning-associated species of dinoflagellates in water from which epidemiologically implicated mollusks are gathered
d. Puffer fish, tetrodotoxin	10 min–3 hrs, usually 10–45 mins	Paresthesia of lips, tongue, face, or extremities, often following numbness; loss of proprioception or "floating" sensations	Demonstration of tetrodotoxin in epidemiologically implicated fish OR Clinical syndrome among persons who have eaten puffer fish
2. Heavy metals a. Antimony b. Cadmium c. Copper d. Iron e. Tin f. Zinc	5 min–8 hrs, usually <1 hr	Vomiting, often metallic taste	Demonstration of high concentration of metal in epidemiologically implicated food
3. Monosodium glutamate (MSG)	3 mins–2 hrs, usually <1 hr	Burning sensation in chest, neck, abdomen, or extremities; sensation of lightness and pressure over face or heavy feeling in chest	Clinical syndrome among persons who have eaten food containing MSG (i.e., usually ≥1.5 g MSG)
4. Mushroom toxins			
a. Shorter-acting toxins:	≤2 hrs	Usually vomiting and diarrhea, other symptoms differ with toxin:	Clinical syndrome among persons who have eaten mushroom identified as toxic type OR Demonstration of toxin in epidemiologically implicated mushroom or mushroom-containing food
Muscimol		Confusion, visual disturbance	
Muscarine		Salivation, diaphoresis	
Psilocybin		Hallucinations	
Coprinus artrementaris		Disulfiram-like reaction	
Ibotenic acid		Confusion, visual disturbance	

Table B-1. Guidelines for confirmation of foodborne-disease outbreaks — continued

Etiologic agent	Incubation period	Clinical syndrome	Confirmation
b. Longer-acting toxin (e.g., *Amanita* spp.)	6–24 hrs	Diarrhea and abdominal cramps for 24 hrs followed by hepatic and renal failure	Clinical syndrome among persons who have eaten mushroom identified as toxic type OR Demonstration of toxin in epidemiologically implicated mushroom or mushroom-containing food
Parasitic			
1. *Cryptosporidium parvum*	2–28 days, median: 7 days	Diarrhea, nausea, vomiting, fever	Demonstration of organism or antigen in stool or in small-bowel biopsy of two or more ill persons OR Demonstration of organism in epidemiologically implicated food
2. *Cyclospora cayetanensus*	1–11 days, median: 7 days	Fatigue, protracted diarrhea, often relapsing	Demonstration of organism in stool of two or more ill persons
3. *Giardia lamblia*	3–25 days, median: 7 days	Diarrhea, gas, cramps, nausea, fatigue	Two or more ill persons and detection of antigen in stool; or demonstration of organism in stool, duodenal contents, or small-bowel biopsy specimen
4. *Trichinella* spp.	1–2 days for intestinal phase; 2–4 wks for systemic phase	Fever, myalgia, periorbital edema, high eosinophil count	Two or more ill persons and positive serologic test or demonstration of larvae in muscle biopsy OR Demonstration of larvae in epidemiologically implicated meat

Table B-1. Guidelines for confirmation of foodborne-disease outbreaks — continued

Etiologic agent	Incubation period	Clinical syndrome	Confirmation
Viral			
1. Hepatitis A	15–50 days, median: 28 days	Jaundice, dark urine, fatigue, anorexia, nausea	Detection of IgM anti-hepatitis A virus in serum from two or more persons who consumed epidemiologically implicated food
2. Norwalk family of viruses, small round-structured viruses (SRSV)	15–77 hrs, usually 24–48 hrs	Vomiting, cramps, diarrhea, headache	More than fourfold rise in antibody titer to Norwalk virus or Norwalk-like virus in acute and convalescent sera in most serum pairs OR Visualization of small, round-structured viruses that react with patient's convalescent sera but not acute sera — by immune-electron microscopy. Assays based on molecular diagnostic (e.g., polymerase-chain reaction [PCR], probes, or assays for antigen and antibodies from expressed antigen) are available in reference laboratories.
3. Astrovirus, calicivirus, others	15–77 hrs, usually 24–48 hrs	Vomiting, cramps, diarrhea, headache	Visualization of small, round-structured viruses that react with patient's convalescent sera but not acute sera — by immune-electron microscopy. Assays based on molecular diagnostics (e.g., PCR, probes, or assays for antigen and antibodies from expressed antigen) are available in reference laboratories.

State and Territorial Epidemiologists and Laboratory Directors

State and Territorial Epidemiologists and Laboratory Directors are acknowledged for their contributions to *CDC Surveillance Summaries*. The epidemiologists listed below were in the positions shown as of October 1996, and the laboratory directors listed below were in the positions shown as of October 1996.

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